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UNESCO's *Teaching and Learning for a Sustainable Future*: A critical evaluation of underlying unsustainable progress myths

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Abstract

The paper examines a representative internet/computer based Education for Sustainability (EfS) learning program aimed at teacher training. Looking at the concept of culture in the program, it provides a critical reading of its implicit and explicit attitudes to science and technology. In order to assess these attitudes, an understanding of science and technology is presented that should form the framework of educational programs committed to sustainability. In addition, the program's understanding of and attitude towards science is measured against its own criteria. The analysis uncovers a startlingly uncritical attitude to Western science and technology and its associated progress myths, as well as an even more far-reaching, naive advocacy of Information and Communication Technology (ICT) and internet as learning tools for EfS. This not only leads to contradictions with the program's stated aims and some of its content, but is hardly conducive to sustainability. The paper argues, therefore, that we need a far more critical approach to Western myths of development and scientific progress if we are to encourage a move towards sustainability through education.

Introduction

My primary task in this paper is to evaluate the science/culture interface in a high-profile education for sustainability (EfS) program called

Teaching and Learning for a Sustainable Future: A Multimedia Teacher Education Programme[1] (TLSF). It is available as an internet site, pdf-downloads, or CD-ROM, and is aimed at "pre-service teacher courses as well as the inservice education of teachers, curriculum developers, education policy makers, and authors of educational materials."[2] It is therefore designed for the most crucial communication link in EfS, intending to train the trainers.

I decided to focus on this particular program because it can be treated as authoritative. It has been written by the Centre for Innovation and Research in Environmental Education at Griffith University, Australia, and an

> international reference group and over 50 Programme Specialists within UNESCO advised on the text and pedagogical approaches used in the programme and ensured that Version 1 of the programme was educationally sound, accurate and up-to-date, fair in its treatment of issues, and culturally appropriate for use in international settings.[3]

Version 1 has then been widely tested and assessed by "an extensive international evaluation by several hundred teachers and educators, sustainable development experts and multimedia specialists"[4] before Version 2.0 (which I am using) was released. In other words, it seems fair to treat the program as representative and acceptable to mainstream EfS initiatives. It is also clearly intended to have global reach.

My intention is to provide a critical reading of TLSF's implicit and explicit attitudes to science (and technology). Thus the paper will fall into three parts. First, I will try to present the understanding of culture used in the TLSF materials and how science fits into this. Second, I will provide an understanding of science and technology that, in my view, should form the framework of educational programs committed to sustainability. Third, I will evaluate the program's understanding of and attitude towards science against its own criteria and the established critical reading of science.

I have to make clear the limitations to my evaluation right from the start. It is beyond the scope of this paper to thoroughly evaluate the entire program. I therefore will not attempt to make any judgements about the overall validity and relevance of TLSF. But I will aim to reach meaningful conclusions about the way the term science is used throughout the program materials, the attitude of the program with regard to the learning technology used, and a more detailed evaluation of the only module explicitly dealing with knowledge systems (module 11: Indigenous knowledge and sustainability).

I also should clarify, at the beginning, my use of the term 'sustainability'. I am fully aware of the Western origin, bias, and the abuse of the term, which is even more pronounced with the more frequently used 'sustainable development.'[5] In my view, any serious notion of sustainability needs to stress the limitations of the Earth and the social justice dimensions which immediately excludes a misuse of the term to justify business as usual and Western-style overdevelopment and overconsumption. I use the following definition: Sustainability is achieved when all people on Earth can live well without compromising the quality of life for future generations. This simple definition contains all aspects that any developments towards a solution of the most pressing problems humankind faces must embrace. We need to: (*a*) retain the resource base, the Earth, in other words, avoid a deterioration of the biosphere, since the biosphere is a "thermodynamically closed and non-materially-growing system,"[6] we should live only off the interest (i.e., the energy provided by the sun) and not eat into the capital base (i.e., diminish non-renewable resources); (*b*) do this within a democratic framework which guarantees self-determination and justice for *all* people on Earth, not just the richest 20 per cent; and (*c*) make sure that we can guarantee a good life for our children, or, as indigenous peoples say, for the seventh generation to come, and not just for us human beings, but also for other species (biodiversity).[7]

We should bear this in mind during the following evaluation.

The Concept of Culture in TLSF: Where does Science fit in?

Marshall Sahlins has made clear that it is important to explain in what sense the term culture is used. Is it what he calls the 'humanistic sense' that allows phrases like 'science and culture' to be meaningful and where the two things can exist alongside and independent of each other? Or are we talking about "culture as the total and distinctive way of life of a people or society."[8] In our context, it seems to me, it only makes sense to use the latter anthropological, holistic sense of the word, because we can only meaningfully talk of sustainability if the totality of our way of life is addressed. Maiteny has reminded us that this totality is not just a snapshot of the present but has a very important historical dimension. He thus defines 'the world of culture' as: "We depend on the maps and symbols, myths and interpretative frameworks, languages and paradigms—that people before us, and before them, have painstakingly developed."[9]

The EfS program under consideration seems to subscribe to the same holistic interpretation. In what can be called the main theoretical introductory text, "Towards a sustainable future," the opening quotation reads as follows:

> Our culture includes our whole system of beliefs, values, attitudes, customs and institutions. It shapes our gender, race and other social relations, and affects the way we perceive ourselves and the world and how we interact with other people and the rest of nature. To the extent that the global crisis facing humanity is a reflection of collective values and lifestyles, it is, above all, a cultural crisis. Culture, therefore, has a central place in the complex notion of sustainability . . .[10]

It seems self-evident that science and technology are part of this culture, and, as we shall see below, a main reason for the cultural crisis we face. Yet in this same core document, there is no mention of science or of technology. To most observers, and certainly to anybody outside the dominant Western world view, it is clear that science is part and parcel of a very specific set of beliefs and values and clearly informs society's institutions, particularly educational ones. To describe this Western scientific world view, Berman uses terms like 'disenchantment' and 'non-participation' because "it insists on a rigid distinction between observer and observed." This leads him to the conclusion that "scientific consciousness is alienated consciousness."[11] Whilst this could be discounted as criticism of the world view of *scientists* only, a Native American indigenous perspective arrives at much the same assessment for what it calls "dominant or Western culture," in which human beings are conceived as living "above, separated or in opposition to nature."[12]

Two points follow from this: First, because of this tradition to view science as 'distanced from', we too easily fall for the temptation to see science as something outside our culture, independent from it, and therefore not worthy of investigation when we look at culture. Second, due to the above and the pervasiveness with which the 'scientific consciousness' has informed our world view, science, as an influence on our 'culture', is obscured and hidden from view.[13] If we look at the figure provided in the same document, we find the four dimensions which make up sustainability:

1. Conservation/Natural: all living things, resources and life support systems;
2. Appropriate Development/Economic: jobs, income;
3. Peace, Equality & Human Rights/Social: people living together;
4. Democracy/Political: politics, policy, decision-making[14]

This in itself is an improvement over the customary three pillars (environment, economy, social dimension), but neither science nor technology are explicitly mentioned.

But how can we meaningfully talk about the need to change values and lifestyles[15] and not even mention the values embedded in science and technology?

Science and Technology in a Sustainability Context

I have claimed above that science and technology are fundamental determinants of our Western culture. I need to corroborate that claim and elaborate on the relationship between our current understanding of science and unsustainability.

First, I have to explain why I conflate science and technology. It is clear that there is a difference between science ("I know that *X* is the case") and technology ("I know how to do *X*).[16] Yet, as stated above, science is never operating in a void, but in a concrete society. While scientific insights might be used in any number of ways, it is apparent that the technological applications of science are driven by the values and the financial and political support of a given society.[17] In today's political and economic climate, however, the seemingly so obvious distinction between science and its technological uses are increasingly blurred. In the context of a General Agreement on Trade in Services-driven world, higher education and research are more and more privatized and therefore subject to commercial pressures.

For research funding, scientists are more than ever at the mercy of the very corporations that want to turn the results of their research into palpable profits. There is substantial evidence that scientists on the payrolls of private corporations skew, or are forced to skew, their results in order to make them fit the objectives set by the corporations.[18] If scientists, rarely enough, refuse to comply, the research is often censored or withheld from the public,[19] leading Krönig to conclude that "there are few independent scientists left."[20] Already there are complaints from biologists, for example, that fundamental areas of research such as taxonomy are neglected because the only research funding you can get these days is in biotechnology and genetics research.[21] Another example is the infatuation with nuclear power for the last forty years. As late as 1997, the OECD countries were still spending over half their energy research budgets on nuclear power and the US alone has sunk more than one trillion dollars into "research funding and sundry other subsidies" for nuclear power since the Second World War.[22] This not only means that states are as guilty of

misdirecting research funding as corporate interests, it also means that for forty years there was hardly any money for research into renewable, sustainable energy forms (the consequences of which we are still feeling today). In reality, therefore, it is often almost impossible to differentiate between science and its application in technology.

Even more importantly, it is precisely our scientific world view and the changes it brought into the world since the Industrial Revolution that has created our current unsustainable situation. Western science, far from being a value-free benefactor for humankind, is the driving force behind the last three hundred years of exploitation of people and natural resources the world over. It was scientific progress and its technological use which enabled the—in retrospect—fatal switch from a humankind living on "current sunlight" to one living off the "savings" by burning "300-million-year-old stored sunlight."[23] There is no known indigenous society which has ever wreaked so much damage on such a scale onto the ecosphere as we have. Mathis Wackernagel, who developed the concept of ecological footprints to measure human impact on earth,[24] has aptly defined our problem: Technology has handed us ever bigger spoons to dip into the "planetary chocolate cake."[25]

I will now elaborate in more detail on some key elements of Western science and technology that contribute to the current unsustainability.

First, reductionism: to concerned scientists it has always been clear that science, if at all, can only give answers in specific and limited areas. Especially in the context of sustainability, we certainly need science to provide us with detailed and accurate understandings of ecosystems or the workings of living organisms. Yet it is equally clear that such knowledge and understanding only plays a certain part in the overall context of sustainable solutions. As the "Century of Development" has shown with numerous failed technological "aid" projects, even the best technical solutions, backed by the latest scientific insights, will backfire if they are not embedded in and driven by democratic control and the real needs and empowerment of those affected.

This insight, however, that science and technology are just one and not even the most important part in a complex mixture of factors, is neither reflected in the way scientific-technological progress has been embraced *nor* in the way it is inherent in the belief structure of modern science. Western scientific methodology is exclusivist, since it claims that its methodology guarantees that it establishes the ultimate and *only* truth about a matter. Turned around, this means that all other forms of knowledge are disregarded and devalued. If you take this "totalitarian temptation of science"[26] together with the abstractness of science and its obsession with technological fixes, it is clear that it produces a very

limited picture of reality and, therefore, we shouldn't be surprised if it fails people and their real needs.[27]

Second, there are the far-reaching impacts new science and technology have on our lives and our world view. Lummis aptly states:

> Choose a technology and you choose the politics—the order of work—that comes with it. Choose mass consumption and you choose mass production and a managed order of work. Choose the big factory and you choose managerial oligarchy and social inequality.[28]

We have grown blind with regard to the institutional, political, social and structural consequences that come with certain types of technology. We generally tend to assume that any new technological development or device comes on its own, without strings attached, so to speak. But that, of course, is far from true. Any technology, as Otto Ullrich writes, forces its "laws upon society in such a way that cultural self-definition and autonomy cannot be maintained for long." This is so because of "a little noted characteristic" of technology with which "typically comes an infrastructural network of technical, social and psychological conditions, without which the machines and products do not work."[29] This fact that "a technology mediates human experience through its selection/amplification and reduction characteristics"[30] is also the most hideous aspect of the 'creeping cultural imperialism', the totalitarian character of Western scientific-technological global rule. It brings with it a ruthless destruction of social, cultural, and political native structures, something which is usually not noticed until it is too late:

> Through technological "development aid" more euphemistically called technical assistance, from the industrialized countries, they receive "Trojan machines" (to use Robert Jungk's phrase), which conquer their culture and society from within. They are forced gradually to absorb an alien industrial work ethic, to subordinate themselves completely to unaccustomed time rhythms, to value objective relations higher than human relations, to experience increasing stress and to regard it as normal, and to accept jobs without regard to motivation or meaning.[31]

We need to become aware of just how much scientific theory and the corresponding technologies construct and determine our reality, rather than serve our needs.[32]

Additionally, there are a number of other points that reinforce the unsustainable thrust of much of our Western approach to science and the type of technology it tends to spawn:

- It is abstract and applied universally independent of local, historical and cultural context, thus violating the sustainability principle of being "culturally appropriate and locally relevant"[33]

- Because research and development is very capital intensive it is primarily benefiting large corporations, rich capital owners and states, thereby violating the sustainability principle of equity
- Our scientific society is inherently expert-based, hierarchic, non-transparent, and money-driven. It tends to be anti-democratic, thereby disempowering ordinary people, in stark opposition to a sustainable society which aims to empower "all sectors of the community to participate in decision-making at local, regional and national levels"[34]
- Its large scale creates dependencies which again undermine equity and empowerment, as well as the precautionary principle and the call for reversibility and flexibility[35]

Schumacher has, in the early 1970s, explained what *type* of science and technology we would need in a sustainability context:

> What needs the most careful consideration, however, is the *direction* of scientific research. We cannot leave this to the scientists alone. As Einstein himself said, "almost all scientists are economically completely dependent" and "the number of scientists who possess a sense of social responsibility is so small" that they cannot determine the direction of research. . . . [This] direction should be towards non-violence rather than violence; towards a harmonious co-operation with nature rather than a warfare against nature; towards the noiseless, low-energy, elegant, and economical solutions normally applied in nature rather than the noisy, high-energy, brutal, wasteful, and clumsy solutions of our present-day sciences.[36]

It follows from the above discussion that we need most of all a very thorough critical evaluation of and reflection on science and any technological application that flow from it within a sustainability framework, because science and technology are, at present, such a dominant driving force for unsustainability.[37] More importantly, this clearly implies that any EfS program will need to have this critique and reflection built prominently into it.

Evaluation of TLSF's Attitude to Science and Technology

The evaluation of *Teaching and Learning for a Sustainable Future* will be carried out in the light of the above framing of science and technology in a sustainability context and against the background of the programs own objectives:

- We have already discussed the programs' holistic notion of culture which ought to encompass science and technology;

- One of the main objectives of the program is to foster "critical thinking;"[38]
- TLSF aims to "encourage ongoing reflection (via a learning journal) as a key aspect of on-going professional development;"[39]
- The program stresses over and over again the aim to be "culturally appropriate and locally relevant"[40] and to be open to adaptation to diverse contexts.[41]

I will evaluate TLSF on three levels: (1) the underlying attitude to science and technology, both explicitly and implicitly; (2) the attitude to science and technology as expressed through the choice of delivery method of the program; and (3) through a more detailed evaluation of module 11.

Attitude toward Science and Technology

As already mentioned, science and technology is not an explicit part of the teaching materials. There is no separate unit dealing with the topic which, given its importance in a sustainability context, is surprising enough. Science itself is very rarely mentioned, most often in module 11, which is why I decided to look at it in more detail.[42] The trouble with this implicit approach to science and technology is that its impact and importance is not assessed or reflected upon. The outcome is that there is a very uncritical implicit endorsement of Western science. In those instances where explicit comments are made, we find a very Westernized position, reinforcing uncritically popular myths about progress, development, and superiority and advancement of Western science.

On the very first page of the first document we find comments which reinforce the notion that equates 'progress' with the mindset of Western science: "Progress increasingly depends upon the products of educated minds: upon research, invention, innovation and adaptation."[43] No mention whatever that this notion of progress has landed us in the mess we are in.

Let us look at the other examples throughout the modules.

- Module 1: "Exploring global realities." The main module pages discuss neither science nor technology. But the module provides an older UNESCO text, *Educating for a Sustainable Future. A Transdisciplinary Vision for Concerted Action*, as the main background text. It presents various popular myths, without critical assessment, such as the following.

- There is no inherent difficulty with science, the real problem is public relations. For example, "the difficulties of communicating science,"[44] and "One of the lessons of recent experience is the need to establish effective communication strategies as an integral part of any major scientific inquiry or programme."[45]
- The North and West, far from being acknowledged to be the cause of our unsustainability problem, is seen as the saviour that can disseminate the necessary science and technology to the South. "The north can, *of course*, help to shorten the interval in which lower standards will be necessary by assisting the south in its development efforts, especially, as concerns education, in the development of its schools, universities and training programs for scientists and other key personnel."[46]
- Even when caution is raised, as in the following quote, it is implied that science and technology can solve *most* problems, though not every single one. Additionally, humanity creates the problems, which science and technology then solve: "While such [scientific and technical] developments are highly encouraging, it would be imprudent to expect science and technology to find a solution to every problem that humanity is capable of creating for itself."[47]
- Scientists are not understood as part of a community of equals, but as the knowledge-bearers at the top of the knowledge hierarchy, who have a moral duty to disseminate their superior insights to the general public: "It is here that the scientific and intellectual communities bear a particular moral responsibility, to ensure that decision-makers as well as the public are fully cognizant of the multiple dimensions of the problems they face."[48]
- At one point, it is even implicitly, though not explicitly, acknowledged that scientific and technological progress could harm the ecosphere. Yet it is phrased in such a way that you gain the impression that this is a new challenge we will face (no precedent) and, more importantly, there can be no discussion about whether or not to have scientific and technological progress. There is only scope to mitigate side-effects. "Each generation inheriting the Earth temporarily shall take care . . . that scientific and technological progress in all fields does not harm life on Earth."[49]

- Even the way education is understood is clearly slanted towards 'science education'. "Education not only provides the scientific and technical skills required, it also provides the motivation, justification, and social support for pursuing and applying them."[50]

- Module 2: "Understanding sustainable development." This module provides us with a typical example of what happens if we do not apply a whole-systems approach as needed for sustainability. *The Earth Charter* is used as exemplary teaching material. In it, right next to each other, two courses of action are advocated: (1) "Support international scientific and technical co-operation on sustainability, with special attention to the needs of developing nations"; and (2) "Recognise and preserve the traditional knowledge and spiritual wisdom in all cultures that contribute to environmental protection and human well-being."[51] There is no realisation that the two are, at least in recent history, mutually exclusive. The worldwide spread of the Western scientific world view is the best known recipe to eradicate completely traditional knowledge and spiritual wisdom.[52] In other words, Western 'progress' will destroy what remains of local knowledge and will thereby undermine the South's capacities for self-sufficiency. This point is particularly pertinent, because TLSF itself advocates, in module 11, that we need to preserve and revitalize indigenous knowledge if we want to become more sustainable (see below).

- In all the other modules, either science is not mentioned at all or without any meaningful context.

TLSF Delivery Method and Critique of Science and technology

One of the most amazing aspects of the TLSF program is the entirely uncritical attitude displayed towards Information and Communication Technology (ICT) and the internet. Akin to the hype that surrounds every new technology (be it the private motor car, nuclear power, or biotechnology) before their drawbacks and unsustainability become apparent, the program and the teaching materials are often hardly more than a veiled sales-pitch for ICT and the web.[53] This is all the more surprising since the program authors and their international advisers could know differently in a time when the unsustainability of computer technology becomes ever more obvious. One just has to imagine the realization of the dream of computer and web aficionados: the resources needed to equip every human being on earth with a PC, the necessary background support in terms of networks, infrastructure, servers, and so

on, would kill off our planet more quickly than the increase of car ownership in China to U.S. levels.[54]

Yet more importantly, precisely in an EfS context, there are serious limitations to internet and computer-based education. Both in terms of the inherent limitations of an electronic medium and in terms of the educational experiences and methods needed to learn holistically, so that learning leads to lasting behavioural change (which TLSF aims to achieve),[55] exclusively computer and internet-based learning cannot be effective.[56] On the contrary, computers seem to be positively detrimental for the formation of a competent new generation that is capable of dealing with our complex reality. Studies show that far from being highly motivating, computers "stunt imaginative thinking" and "isolate students emotionally and physically, from direct experience of the natural world."[57] Computers in fact might produce exactly the incompetence which perpetuates unsustainability. The US National Science Board, for one, "reported in 1998 that prolonged exposure to computing environments may create 'individuals incapable of dealing with the messiness of reality, the needs of community building, and the demands of personal commitments.'"[58]

Raising awareness and knowledge about problems alone simply does not lead to behavioural change.[59] As Bowers has shown, what we have said about science in general is especially true for computers and the internet: they are not value-free, inherently beneficial, culturally 'empty' tools, but they introduce and reinforce very specific cultural values, ways of viewing the world and understanding issues. "Members of other cultures are aware that when they use computers they must adapt themselves to radically different patterns of thought and deep culturally bound ways of knowing."[60]

In view of the positively detrimental effects ICT and internet-based education can have in a EfS context[61] and given that "critical thinking" is one of the main objectives of the program,[62] it is almost unbelievable how uncritically TLSF advocates their use. Below, I give some of the starkest examples.

- ICT and the internet are credited with positively contributing to "a far more rapid and wider dissemination and application of innovations than was the case even a decade ago,"[63] without realizing that this spread of 'innovation' is the spread of a lifestyle, world view, and scientific-technological system which is unsustainable.
- The program prides itself for "the many different types of professional development activities" that allegedly make for "a rich variety of learning experiences that cater to many learning

styles."[64] Yet all the activities can only be carried out glued to a computer screen with an internet connection. Where, exactly, is the variety, and where, exactly, are tactile, oral, spatial, and other learning experiences catered to, not to mention the crucial unmediated experiences out in nature? This is a particularly important point because the program itself advocates "experiential learning" (in the usual sense), "enquiry learning," and "learning outside the classroom" in modules 18, 21, and 24.

- Given the vast differences in access to the internet world-wide, which is even acknowledged elsewhere,[65] the associated language imperialism and the almost complete dominance of the hardware, software, and connection infrastructure by Western multinational corporations, the claims that the multimedia format increases access and that this particular media allows for better national and regional adaptation[66] sound rather hollow.
- The program's objectives are a very interesting case in point. Out of six points, two relate to ICT and computer literacy.[67] The program never explains why there should be a link between EfS and ICT and computer literacy, it is just assumed that this is "of course" the case, even though there is strong evidence emerging that this is far from the case (see above).
- After talking about encouraging "ongoing reflection" and dealing with the "value laden nature of sustainable development," one of the programs aims is to illustrate "the potential uses and benefits of multimedia technologies in pre- and in-service teacher education."[68] Later on, in the section "Multimedia Learning Approach," there is even an activity where students have to "Analyse the relative importance of these nine advantages of multimedia-based learning."[69] As in the first instance, it doesn't even occur to the authors that there might be drawbacks and disadvantages to using multimedia approaches. How does this fit in with critical reflection?
- "New communication technologies are resulting in basic changes in the way people learn and in the student-teacher relationship. The introduction of multimedia to the classroom can lead to higher-level thinking as the computer takes care of low-level routine tasks, supports inquiry learning by making available a wide range of resources, accommodates different learning styles, and changes the role of the teacher from knowledge source to learning facilitator."[70] Sounds fantastic! The trouble is that, as a comprehensive survey recently found, "30 years of research on educational technology" has not been

able to prove any positive impact of ICT on learning at all. Apart from drill-learning "there is no clear, commanding body of evidence that students' sustained use of multimedia machines, the Internet, word processing, spreadsheets, and other popular applications has any impact on academic achievement."[71]

- The infatuation with the technology even leads to a perversion of the concept of 'experiential learning'. While it is usually used to describe learning through experiencing real-life situations, here it turns into exclusively computer-internet based learning, entirely abstract and devoid of context, community, history, and real life. In TLSF it means to "analyse and interpret information in a variety of forms (e.g., text, tables, diagrams, computer games, and linked WWW-sites)."[72]

- Finally, there follows a section which amounts to little more than an uncritical glorification of the internet, something you might expect to find in an advert or a computer magazine, but hardly in a tool that has been rigorously tested and reviewed by educational professionals all over the world and that claims to be based on "academic rigour, experiential learning and reflection."[73] The section is entitled "The Internet - A Web of Information and Discovery," with the headings "Unlimited and Evolving," "Up to date," "Inexpensive," "Searchable," "diverse authorship," "interactive," "Asynchronous interaction," "any place," and "any time."[74] Every single one of these points reinforces values of the Western scientific world view that are unsuitable for sustainability. Even without contemplating the implications for EfS, it is easy to provide a list of different headings which command more corroborating evidence: "The Internet – A Web of Disinformation and Popular Myths," "Information overload," "Data instead of knowledge and wisdom," "Speed instead of contemplation," "very expensive" (if all costs, including whole-life costs are acknowledged), "limited use of most search engines," "hidden context and agendas of authors," "electronically interactive, but not communicative," "abstract, outside real local places and times."

Analysis of Module 11

There are two very interesting facts about this module. First, it provides a rather harsh critique of the destructiveness of the Western way of life and world view (including its educational systems) in its role to annihilate what are essentially societies which "have a broad knowledge

of how to live sustainably."[75] Focussing on the educational aspect we read:

> However, formal education systems have disrupted the practical everyday life aspects of indigenous knowledge and ways of learning, replacing them with abstract knowledge and academic ways of learning. Today, there is a grave risk that much indigenous knowledge is being lost and, along with it, valuable knowledge about ways of living sustainably.[76]

Second, it acknowledges right from the start that "indigenous knowledge is the local knowledge that is unique to a culture or society;"[77] in other words, that indigenous knowledge is precisely the type of culturally, locally, and historically adapted and tested knowledge which, according to the analysis above, we would need for a sustainable society (quite in opposition to Western scientific knowledge systems).[78] To come back to the beginning of the paper, we could also say that indigenous knowledge recognizes the holistic notion of culture and doesn't pretend to be universally applicable. It is connected to a particular people and environment. As a group of Inuit people phrased it: "Our knowledge is holistic—it cannot be compartmentalized and cannot be separated from the people who hold it. It is rooted in the spiritual health, culture and language of the people. It is a way of life."[79] This type of knowledge thus avoids the totalitarian dimension of Western science which starts from the assumption that it can be imposed on any corner of the globe, irrespective of context, history, or culture.

The case studies provided[80] all show that indigenous peoples often adhere to principles of sustainable living which we in the West have long unlearned: a sense of caring, a notion of stewardship which acknowledges that we don't own Mother Earth, a cultural rejection of greed and amassing of wealth, a deep understanding of the effects of our activities on our surroundings and "a sense of belonging to a place."[81] Indigenous perspectives are characterized by a reverential and holistic, rather than reductionist and interventionist view of life: "all of life—mountains, rivers, skies, animals, plants, insects, rocks, people—are inseparably interconnected."[82]

The indigenous perspectives presented also make explicitly clear the opposition of the Western world view to an indigenous and, by implication, a sustainable one. We read, for example:

> The predominant Western world view is that nature must be studied, dissected, and mastered and progress measured by the ability to extract secrets and wealth from the Earth. Indigenous people do not consider the land as merely an economic resource.[83]

The module does clarify that it is not the indigenous peoples, but the industrial world that has created the ecological crisis we live in. We can also read from the material that part of the problem we face is the condescending view of the West and its experts towards indigenous peoples. Despite the wealth of evidence to the contrary, it is still the case that "few industrial economists would admit they could learn from indigenous people."[84] The same is true for Western scientists[85].

It is indigenous peoples who know how to live sustainable, not the West.[86] The module shows that we can learn from them with regard to all elements of sustainability, in terms of understanding that Mother Earth is fundamental to all life, in terms of social and political organization, with regard to "appropriate" science and technology and in terms of economic systems. In fact, looking at almost any aspect it seems to transpire that the Western system is, historically and in the context of sustainability, the aberration from the paths to follow.

From the discussion of indigenous education, it could be learned that computer-centred education, just as teacher-centred education, is detrimental to EfS because of its abstractness and alienation from local people, knowledge systems, environments, and histories.[87] If we look at the table of comparison provided between indigenous and formal education, we note that most competencies needed for a sustainable lifestyle are provided by the former,[88] thus throwing significant doubt onto the ability of Western approaches to education and scientific knowledge to contribute to sustainability.

Conclusion

What is most interesting about module 11 is that the conclusions which naturally flow from it—namely, that we need to learn from indigenous knowledge systems and ways of learning for education for sustainability, and that we need locally focussed, developed, and adapted learning tools rather than one-size-fits-all programs like TLSF, which obliterate this cultural diversity—are not at all drawn to inform the program itself, neither in terms of content and module choice nor in terms of learning media. In other words, the insights gained from what is a perceptive discussion of indigenous knowledge in this particular module are not applied to the program as a whole. This again confirms a finding from the discussion about science and ICT above, namely that critical and complex thinking (which is fundamental to any EfS) is only very partially applied throughout the program.

It is also clear that inherent contradictions are not recognised. Mainly because Western science is not openly discussed and critically

evaluated, we end up with an implicit message throughout the program that Western science is the pinnacle of progress. At the same time, within the module on indigenous knowledge it is acknowledged that Western science and the Western way of life are indeed the main reason for our unsustainable present and that

> indigenous knowledge is not only important in its own right, but is also important for the benefits it brings to . . . all the other people around the world who can learn lessons for living sustainably from it [and to] the Earth which would be treated more carefully if indigenous knowledge and values were followed more widely.[89]

It is for these reasons, and not its undoubtedly good intentions and often brilliant materials in most modules, that I find TLSF deficient. The entirely uncritical attitude towards Western science and technology, in particular ICT, in the main body of the program and the inherent contradictions between this understanding and the conclusions drawn from the discussion of indigenous knowledge as well as the contradictions between the guiding principles of critical thinking and reflection and uncritical acceptance of underlying myths of the Western consumer societies reveal that, despite the widespread international evaluation, the program is not carefully thought through and in particular falls into one trap that is characteristic of most discourses about sustainability.

The program is written and thought from a Western perspective. We then look from our position, which is not reflected, onto the Other, (indigenous people) and might, as in module 11, learn valuable insights from them. Yet the most important thing, as Wolfgang Sachs has pointed out, is to apply the "home perspective,"[90] that is, to look at 'us' in the West, "for the problem of poverty lies not in poverty but in wealth. And equally, the problem of nature lies not in nature but in overdevelopment."[91]

The focus and direction of our gaze is the problem: we shouldn't talk about underdevelopment, because the problem is our *over*development; one of the main strands of the Johannesburg summit shouldn't have been poverty, but *wealth*; the main problem in a sustainability context is not lack of progress, but the type of scientific and technological progress we in the West have developed which led to our destructive and exploitative consumerist society. TLSF, except in one module, does not do enough to correct the prevailing perspective and therefore will fail to initiate the necessary radical change towards a more sustainable future.

Appendix A

List of Modules	Referenced Filename
About this programme	about.pdf
The professional development experience	development.pdf
Towards a sustainable future	towards.pdf
Computer talk	computer.pdf
Using the programme	help.pdf
1. Exploring global realities	mod01.pdf
2. Understanding sustainable development	mod02.pdf
3. A futures perspective in the curriculum	mod03.pdf
4. Reorienting education for a sustainable future	mod04.pdf
5. Accepting the challenge	mod05.pdf
6. Sustainable futures across the curriculum	mod06.pdf
7. Citizenship education	mod07.pdf
8. Health education	mod08.pdf [file damaged, not downloadable]
9. Consumer education	mod09.pdf
10. Culture and religion for a sustainable future	mod10.pdf
11. Indigenous knowledge and sustainability	mod11.pdf
12. Women and sustainable development	mod12.pdf
13. Population and development	mod13.pdf
14. Understanding world hunger	mod14.pdf
15. Sustainable agriculture	mod15.pdf
16. Sustainable tourism	mod16.pdf
17. Sustainable communities	mod17.pdf
18. Experiential learning	mod18.pdf
19. Storytelling	mod19.pdf
20. Values education	mod20.pdf
21. Enquiry learning	mod21.pdf
22. Appropriate assessment	mod22.pdf
23. Future Problem Solving	mod23.pdf
24. Learning outside the classroom	mod24.pdf
25. Community Problem Solving	mod25.pdf

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Notes

[1] UNESCO 2002

[2] about pdf, p. 1. I am quoting directly from the pdf-download files. Appendix A provides a concordance of program units and filenames.

[3] about pdf, p. 11

[4] Ibid.

[5] See Bruno and Karliner 2002

[6] Costanza, Segura, and Martinez-Alier 1996, p. 2

[7] For more details on the concept of sustainability, see Jucker 2002, pp. 19–79.

[8] Sahlins, quoted in Perez de Cuellar 1996, p. 21

[9] Maiteny 1999, p. 132

[10] UNESCO 1997, para. 111–112, quoted in towards pdf, p. 1

[11] Berman quoted in Maiteny and Parker 2002, p. 64

[12] Pierotti and Wildcat 1999, p. 192

[13] It is worth adding that part of the reason we don't "see" the cultural specifity of scientific discourse is that it mostly happens in English. We think of English as the

world's *lingua franca*, but of course this language is highly culturally specific and embedded in it are culturally specific world views so that "language thinks us as we think" (Bowers 2001, 142).

[14] towards pdf, p. 3

[15] about pdf, p. 2

[16] Ryle, quoted in Dunbar 1996, p. 17

[17] see Maiteny and Parker 2002, p. 23

[18] Ferrara 1998; Gorelick 1998

[19] Klein 2001, pp. 99–101

[20] Krönig 2002, p. 10

[21] see Orr 1994, pp. 9–11

[22] Myers 1998, p. 69

[23] see Hartmann 2001, p. 15

[24] see Wackernagel and Rees 1996

[25] Wackernagel 1997

[26] Alvares 1992, p. 229

[27] Angayuqaq Oscar Kawagley and Ray Barnhardt tell a very interesting story in this context. Some scientists of the State Department of Fish and Game and the Department of Natural Resources wanted to do research in the Minto Flats, Alaska. They met with elders of the native people living there and basically regarded all this as a one-way process. These scientists assumed that only they knew how to acquire knowledge and that they would have to impart this knowledge to the ignorant natives. There were five scientists with different specializations, all going about their ways with different methods, and ignorant of each other's approaches. They were then completely dumb-struck when they were confronted by one elder of the natives, Peter John, who could provide them more or less offhand with most of the information they wanted to find out in the first place, and could indicate where and why they would run into trouble with the proposed methodology and their elaborate technical equipment; all this on the basis of accumulated knowledge over generations and an intimate knowledge of the area through long-term, first-hand experience. In the end, it turned out that the ignorance was somewhere else than anticipated. "While the scientists with their specialized knowledge and elaborate tools were well intentioned, the gulf between their compartmentalized, limited-time-frame view of the world and the holistic, multigenerational perspective of Peter John appeared insurmountable. The fish and game people couldn't see beyond their constituent areas of expertise to connect with what the elders were trying to tell them, though the Minto people had a quite sophisticated understanding of what the fish and game specialists were talking about" (Kawagley and Barnhardt 1999, 125).

[28] Lummis 1996, p. 98

[29] Ullrich 1992, pp. 284–285; see also, using the concrete example of Ladakh, Norberg-Hodge 2000, p. 142

[30] Bowers 1995, p. 79

[31] Ullrich 1992, p. 285

[32] Donald MacKenzie has very convincingly shown how this happens in the case of modern high finance. The entire current global financial markets, as they dominate economic life (i.e., 97 % speculation, 3 % directly related to real production and trade), would not exist without the economic theory and the accompanying mathematical equation by Black, Scholes, and Merton (for which the last two received the Nobel Price for economics in 1997) and the power of modern computers to make the formula useable. When the three scientists first published their formula in 1973, the market in speculative capital was virtually zero, and their formula was proved wrong in 40 per cent of the empirical cases to which it was applied. Now speculative trading amounts to US$87.9 trillion per annum and most of it conforms to the equation. In other words, if you get enough people to believe in your ideology, with all its assumptions, preconditions, and the world view it conveys, the world turns into what you predicted. “Self-fulfilling prophecy” we call it with and Robert K. Merton (ironically, the father of the Robert C. Merton of Black, Scholes, and Merton). Or as MacKenzie sums it up: “finance theory describes not a state of nature but a world of human activity, of beliefs and of institutions. Markets, despite their thing-like character, their global reach, and their huge volumes, remain social constructs” (MacKenzie 2000, 32).

[33] towards pdf, pp. 1–2

[34] Ibid., p. 7

[35] For a more in-depth discussion on the above see Jucker 2002, pp. 176–196

[36] Schumacher 1993, pp. 116–117; see also Norberg-Hodge 2000, p. 164

[37] Fisheries are a very good example for the unsustainability of many high-tech tools. Modern fishing boats are such potent catchers that they literally destroy the fisheries they depend on (see Bowers 2000, 50–51).

[38] about pdf, p. 6

[39] Ibid., p. 8

[40] towards pdf, pp. 1–2

[41] about pdf, p. 20

[42] There are sub-sections or individual items on technology in some modules (mod. 03 pdf, pp. 8, 9, 16; mod. 06 pdf, pp. 33–34; mod. 13 pdf, p. 45; mod. 14 pdf, p. 28, and mod. 15 pdf, pp. 4, 8). But technology is either mentioned only in passing or at a level that does not allow a serious critique of our technological world view. The only exception is module 15, where an entire page is devoted to a discussion of the costs of modern agricultural technology (mod. 15 pdf, p. 8). But even here, more fundamental connections to culturally dominant values are not made.

[43] about pdf, p. 1

[44] mod 01 pdf, p. 41

[45] mod 01 pdf, p. 61

[46] mod 01 pdf, p. 54, emphasis added

[47] mod 01 pdf, p. 56

[48] Ibid., p. 82

[49] Ibid., p. 84

[50] Ibid., p. 86

[51] mod 02 pdf, p. 35

[52] see Alvares 1992, p. 230

[53] A brief glance at the long history of failed educational technology should have cured us of such illusions. Larry Cuban, Professor of education at Stanford University, notes that "education policymakers have careered from one new technology to the next—lantern slides, tape recorders, movies, radios, overhead projectors, reading kits, language laboratories, televisions, computers, multimedia, and now the Internet—sure each time that they have discovered educational gold. Eventually, the glimmer always fades, and we find ourselves holding a lump of pyrite—fool's gold.' (Cordes and Miller 2000, 97)

[54] Jucker 2002, pp. 197–205

[55] see about pdf, p. 2

[56] see Bowers 2000

[57] Cordes and Miller 2000, p. 4

[58] Ibid.

[59] Maiteny and Parker 2002, p. 71

[60] Bowers 2000, p. 22

[61] An important point here (which I owe to Chet Bowers) is the fact that the use of computers contributes to the loss of linguistic diversity, which is closely connected to the loss of bio-diversity. Computers lead to wider use of a few major languages, thereby further undermining the languages of smaller cultural groups.

[62] about pdf, p. 6

[63] mod 01 pdf, p. 35

[64] development pdf, p. 4

[65] mod 09 pdf, p. 33

[66] about pdf, p. 2

[67] Ibid., p. 6

[68] about pdf, p. 8

[69] development pdf, p. 7

[70] Ibid., p. 1

[71] Cordes and Miller 2000, p. 3; see also Jucker 2002, pp. 205–210

[72] development pdf, p. 2

[73] Ibid., p. 1

[74] Ibid., p. 9

[75] mod 11 pdf, p. 1

[76] Ibid.

[77] Ibid.

[78] For more details on this point see Apffel-Marglin/PRATEC 1998.

[79] mod 11 pdf, p. 5

[80] Ibid., pp. 13–22

[81] Ibid., p. 13

[82] Ibid.

[83] Ibid., p. 14

[84] Ibid., p. 18

[85] see mod 11 pdf, p. 16

[86] mod 11 pdf, p. 18

[87] see mod 11 pdf, pp. 35, 40

[88] mod 11 pdf, pp. 36–37

[89] Ibid., p. 10

[90] Sachs 1999, p. 86

[91] Ibid., p. 89