Complexity:
A Challenge for Education for Sustainability

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– Abstract –

Intended Contribution: Paper Presentation (20 min.) or Poster Presentation (5 min.)
Topical Areas: Environmental Issues (sub-area: Sustainable Development),
Applications and Programmes (sub-area: Environmental Education)

Looking carefully, almost every environmental communication has to deal with inherent complexity: First, the communicated topics are usually linked to many other ecological, economic and social topics. Therefore, it is necessary to constantly decide which of these aspects you want to include in or exclude from your communication. Second, communication itself is a complex process, as there are at least two different persons who have an individual background, an individual way of thinking and an individual way of communicating – but who still want to exchange information without being misunderstood. Therefore, it is necessary for the communicators to constantly check the other one's reaction and to adjust themselves to it. So, the call for *Network Thinking* and *Dealing with Complexity* might truely not be something really new (e. g. VESTER 1984), but: It is still crucial when communicating today's complex (environmental) problems – no matter if you work with new information and communication technologies or not (WERSIG 1996).
Already since the 1980s, there are results of psychological studies (e. g. DÖRNER 1989) which explain why humans have difficulties in dealing with complexity. Ever since that time, several books have been written about methods to improve the human way of dealing with complexity. **Fig. 1** (attached) shows the characteristics of complex systems and those of complex decisions, while **Fig. 2** (attached) summarises typical problems in dealing with complexity and recommendations for teachers. Despite all the research work in the field of complexity, many politicians and educators still do not sufficiently reflect upon the complexity of problems they deal with. The reasons for this reach from a lack of consciousness to short-term personal advantages and rigid institutional structures. The crucial question is: Can we find an appropriate balance between these factors and an acknowledgement of complexity?

In this context, the concept of *Sustainable Development* can be regarded as a strategy to reduce the complexity of global environmental and social problems by providing a shared vision to act according to: To make sure that development meets the needs of the present without compromising the ability of future generations to meet their own needs (HAUFF (Ed.) 1987). Now, in order to realise this vision, two methods can be distinguished:

1. One method is to *analyse and categorise* the negative global developments, so that, in the end, an easily comprehensible number of starting-points can be deduced from it. Therefore, the final aim is to *reduce unsustainable developments*. A good example for this method is the concept of global "degeneration patterns" or "syndromes" developed by the WBGU[1]. These "syndromes" summarise similar causal nets for environmental degeneration and can therefore be found in different geographical regions – for example the syndrome of mass tourism (WBGU 1996).

[1] WBGU = Wissenschaftlicher Beirat der deutschen Bundesregierung für Globale Umweltveränderungen; engl.: German Scientific Advisory Committee for Global Environmental Changes

2. The other method is to *develop further positive visions* that canalise the wish for a life worth living by formulating attractive sustainable alternatives – for example: “Living good instead of having much” or “De-acceleration” (BUND & MISEREOR (Ed.) 1995). In this case, the final aim is to *put sustainable alternatives into action*.

These two methods both lead to more orientation in the whole by being fuzzy and shapeable in detail. And they are complementary: We need to find out what we don’t want and how we can prevent it, *and* we need to find out what we want instead and how we can achieve it. In order to be motivated for a change, we need negative feelings like fear as well as positive feelings like anticipation.

If a society really wants to change its orientation towards a more sustainable development, it is also necessary to change the education of young citizens, because they are the *decision makers of tomorrow*. Now, society has always held the requirement that school prepares the students for real-life and for the future. But especially industrial societies tend to become more and more complex, and the future tends to be more and more unpredictable. Therefore, this old claim is actually becoming a real challenge (see **Table 1**, attached).

But how do teachers deal with this challenge?
Which are the expectations of their students?
Which methods are recently used for teaching complex themes at school?
And what could be done to support teachers in dealing with complexity?

In order to find out more about the real situation at school, I accompanied three committed teachers of a German Gymnasium (high-school). I visited some of their lessons, examined their students via a questionnaire and encouraged the teachers in interviews to talk about their motivations, occurring problems and proposals for improvement.

The evaluation will be finished in May, 2002.
I look forward to presenting some interesting results.

Literature

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– Attachment –

Fig. 1: Characteristics of complex systems and complex decisions

Characteristics of complex systems

- Many different variables
- Many different connections
- Dynamics
- Irreversibilities

Characteristics of Humans

- Limited ability to perceive
- Limited ability to process
- Limited ability to memorise

Dangers	Characteristics of complex decisions	Challenges
• Belief of omnipotence: To deny human limitations • Belief of impotence: To deny human abilities • To accept constraints without analysing them	• Uncertainty/ Intransparency	• To identify and recognise human limitations in interpreting data as well as human ability to learn • To think in alternatives
• To get lost in details	• Time limit (pressure to act)	• To set priorities and concentrate on important factors of a problem
• To fail to notice other aims by concentrating on a single one	• Plurality of aims	• To pursue several aims at the same time
• To assume that the own point of view is universal: a) Egocentricity b) Eurocentricity c) „Centricity of the present“	• Multiperspectivity	• To compare different points of view with each other: a) within a region b) between different regions c) between different generations

Fig. 2: Typical problems in dealing with complexity and recommendations for teachers

	Typical Problems	Recommendations
PSYCHO-LOGICAL OVERSTRAIN	• Linear Thinking	• To practice thinking in networks
	• Thinking in simple causal-chains	• To practice the analysis of side-effects • To keep in mind those things that should stay the same
	• Assuming well-known effects in unknown contexts	• To practice thinking in alternatives
	• Retreat to well-known and graphic facts, avoiding the new	• To start from the well-known and concrete and to lead up to the new and abstract, enabling individual or at least several intakes to a subject
	• Paralysing fear when being confronted with something unknown or unfamiliar	• To dose gradually when confronting with something unfamiliar • To create a relaxed and enjoyable atmosphere • To arouse curiosity
PHYSICAL OVERSTRAIN	• Limited ability of the human brain to perceive, process and memorise	• To discuss technology as a supplement for human abilities (e. g. computer simulations for a time-lapse effect) • To change overstraining structures (e. g. more tolerance to „mistakes“)

Table 1: The increasing complexity of industrial societies and pedagogical challenges (without claim for completeness)

Driving Forces for Increasing Complexity	Discourse	Pedagogical Challenges
Increasing differentiations within society	Discourse about „Individualisation“	• To enable individual intakes to a subject
Increasing internationalisation of economic affairs	Discourse about „Globalisation“	• To relate local and global phenomenons to each other • To encourage and qualify for a lifelong learning
Increasing scope of interventions into nature in terms of space and time	Discourse about „Risk Society“	• To learn to judge scientific results • To allow and overcome fears
Increasing connectedness within information and communication flows	Discourse about „Information Society“	• To train the ability to judge the quality of information • To mediate and accompany the learning processes instead of just passing on knowledge