

Trends and Current State of Environmental Education in Germany

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Abstract

The development and present situation of environmental education in Germany, differs from most EU countries in three ways: first, environmental awareness and education spread *earlier* than in most member states; second, educational concepts and approaches are extremely *diversified*, because educational authority rests with the 'Länder', or the regional governments, some of which care for larger school populations than several European states; third, Germany faces considerable *problems* after the unification, because the two former states – one with high, the other with low public awareness and environmental standards – need to be amalgamated.

This article focuses on the former Federal Republic, since available information does not permit a reliable overview of the unified country. The introduction indicates the basic context of the scientific discussion. The second chapter then interrelates traditions of nature conservation and early public awareness of pollution to the growing complexity of environmental concepts till the mid-80s. With this in mind, the third chapter sketches the importance of the social environment to environmental education. This is done on two levels, including a discussion of the empirical data with regard to changes at the school level since 1985 and indications of inadequate teacher training. The final outlook points out unsolved problems in research, respective to necessary improvements in training and teaching.

1 Introduction

The environmental problems, which presently plague our planet, seem to unmask man's limited ability either to integrate his social systems into the biosphere, or to interrelate his social sphere more harmoniously with the biosphere. The solution to these problems demands a development of concepts which overcome the fundamental barriers between the '*two cultures*', of the natural and social sciences. However, most sciences simply added new environmental subdimensions to themselves, without changing their

traditional paradigms. Thus, economy included environmental factors into its cost-benefit calculations, environmental law emerged as a subdiscipline to law, etc. Though easy to understand in the face of their different conceptual traditions, these self-perpetuating mechanisms of the sciences detracted from interdisciplinary studies. Cross-fertilization of the different results was even limited, because of the way in which 'environmental factors' are defined in each science. The economist discusses environmental factors in terms of an internalization of external effects, the biologist in terms of their impact on the flexibility of living systems, while the social scientist speaks in terms of human and social influences on nature and its repercussions on society.

- This scientific debate was more or less dominant in German research till the *mid-70s*, when several schools and school projects took already increasing interest in more complex field studies (Northemann 1970, pp. 837f.; Rupprecht 1975).

Although most research was still linked to subject interest and frameworks in the 80s, awareness grew that the totality of the natural-, as well as the technological- and social-built environments demands integrating the dissociated study branches. An *ecological synopsis* with strong social dimensions was demanded, because the ecological equilibrium is endangered for the following reasons:

- First, man lacks an instinctive sense to select an adequate 'biotope', while his perceptions of nature are psycho-social 'constructions of reality' (Tinbergen 1972, p. 107);
- second, man perceived himself in Europe for several centuries as the centre of the globe (Classen-Bauer in press), subjugating nature to social demands and economic interest;
- third, the more man tried to relief himself from the demands of nature, the less he integrated his aims into natural cycles making civilization his second, if not primary, nature (Heidegger 1963);
- and finally, the development of social subsystems and traditions affecting behavioral patterns and ecological awareness, do not match the accelerated development in natural science, technology, and economics.

In general, the *human 'steering' of ecosystems* depends as much on precise data (e.g. with regard to interdependence of natural systems and pollution) as on social demands on and changes of nature and social perceptions with regard to the principle of sustainability. It goes almost without saying that sensory-physiology, environmental stimuli and social awareness-filters jointly make up our perception of nature, that value systems strongly influence our attitudes towards nature, and that the readiness to protect nature depends on the endeavour for human survival. Accordingly, short-term technological

means with partial aims (e.g. in terms of catalysts) need to be related to medium-range social policies (e.g. in terms of energy consumption) and to long-term behaviour changes in the population (e.g. in terms of a sustainable development of life systems or the principle of retinity) (Sachverständigenrat 1994, pp. 11ff., 156ff.). The efforts at the different levels are all equally important.

An ecological synopsis is all the more needed, since different *levels of networks* (biological, physical, human, etc.) (Eulefeld 1992b, pp. 33ff.) communicate with each other so that the spreading effect may occur 'vertically' (between levels) and 'horizontally' (within levels) at the same time. For instance, biological and geographical interrelations are largely influenced by the social systems.

On the whole, ecological problems cannot be analyzed successfully by traditional approaches. The well-established *subject-specific concepts* are limited, because one cannot at the same time, and with the same concepts separate variables from a wider context, then interpret them with and in a holistic scheme. Natural or social sciences alone are not adequate. The *systemtheory-approach* is not sufficient too, since systems are not a value as such, and are often not open-ended enough for the culture specific processing of nature observation and ecological interpretations. Even an *interdisciplinary superstructure* is not the whole answer, since physical, physiological and psycho-social structures cannot be observed in the same way, although they effect one another (Döbler 1992).

- Discussions arrived at this point in the *mid-80s* in Germany, when politics as well as public opinion had become quite engaged with environmental challenges. However, before the state of environmental education since that time will be discussed, an overview will be given of the underlying earlier developments.

2 Environmental Education Till the Mid-80s

In Germany many different roots of the *conservation movement* began in the *19th Century* (Linse 1986, pp. 14ff.). Already the first association for environmental conservation, founded in 1899, was aware that protection of nature and promotion of environmental awareness, had to be interrelated (Eulefeld 1992a). Although an increasing number of people and institutions took interest in environmental conservation till the mid-20th Century, the *ecological approach* carried little reputation till the *late 50s* (Klaauw 1965).

It suffered largely from its restrictions to the fields of biology, with lack of elaboration on such topics as Uexküll's position, who pointed out before World War I to what extent environmental perception and interpretation are related to species-specific senses and environmental contexts. Even worse, the first 'institute for environmental research' Uexküll founded in Europe before World War II, had to be annexed to the medical department of Hamburg University, because the biologists simply did not care (Uexküll 1921, 1980). Some major hallmarks of the conservation development are summarized in Table 1.

In spite of these shortcomings, *educational interest* increased in environmental dimensions *since the 50s*. In fact, the school subjects -primarily biology and geography - paid increasing attention to nature protection and landscape conservation. In 1953 the coordinating Conference of the Cultural Ministers of the 'Länder' set up guide lines for teaching, which encouraged the schools to acquaint their students with nature protection for economic reasons, with careful landscape treatment in view of human food, water balance, and biological stability. But this relatively broad concept, linked with school gardening, did not gain widespread support and was brushed aside in the *late 60s* as new pollution problems came to the forefront. Particularly biology and geography quickly reacted to these challenges, and air-, water- as well as soil pollution became almost teaching-classics. For a while the main focus of environmental education remained with these themes and was primarily linked to the natural science approach. This was largely due to the fact that even research and politics largely neglected human and economic dimensions of pollution in the 60s, so that a complex awareness of the many interdependencies between natural and social systems was more or less lacking.

It was not until the beginning of the *70s* that a great swing toward environmental concern took place in politics, *public opinion*, research, and education. Then, however, daily media reports of pollution nightmares coincided with activities of local self-help groups, with initiatives of the green movement, with an 'immediate programme for environmental protection' by the Government (1971), and with increasing ecological research after the Ecological Society was founded in 1969 (Küppers, Lundgreen & Weingart 1978, pp. 24ff., 55, 138f.; Bunz 1973, pp. 3ff., 31ff.). In less than two years, information swayed the German public in favour of pollution control, when environmental discussions became highly politicized and spread also to the education sector. The following table and examples illustrate the trend (Kepplinger 1989).

Table 1: Development of Nature Protection.*

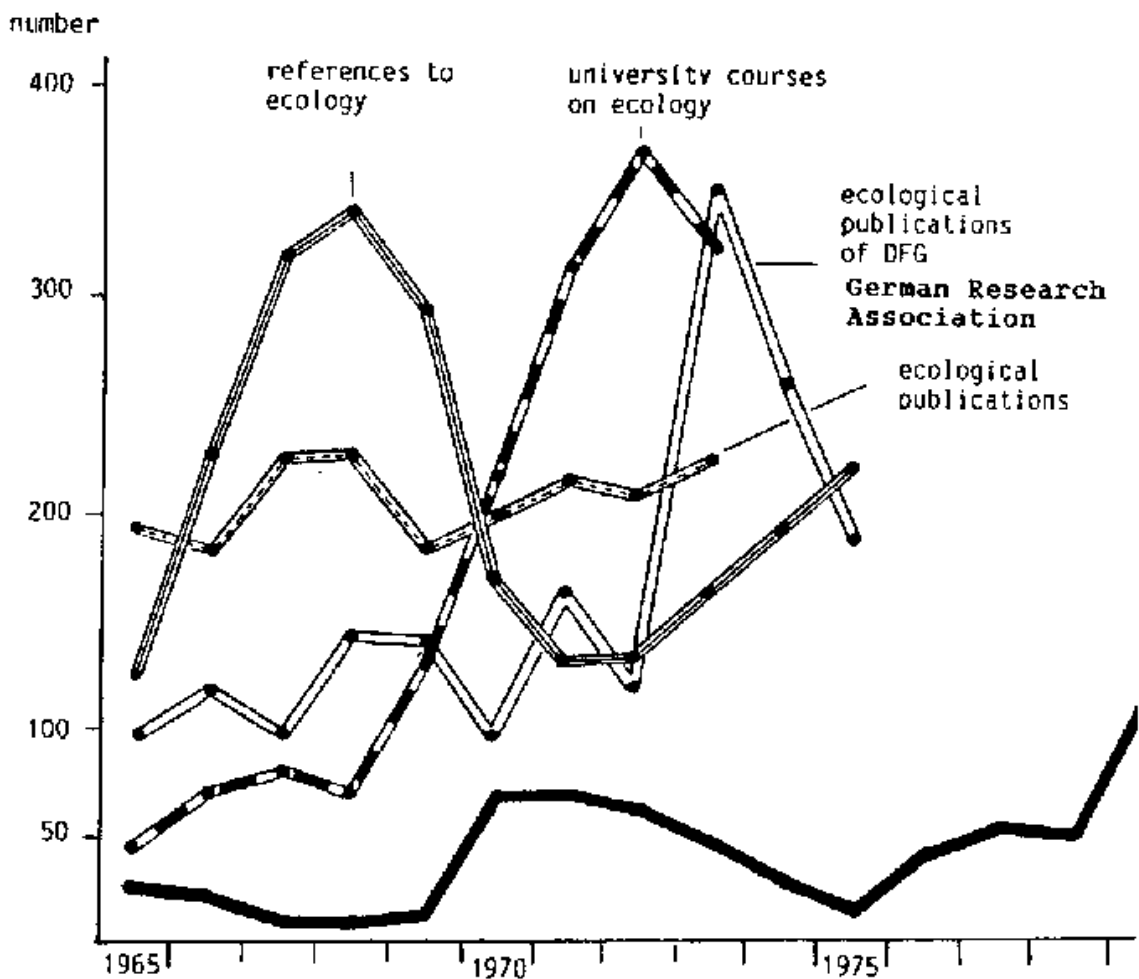
<p>After regional decrees to reduce polluting effects since the middle ages (e.g. 1407 at the city of Goslar to reduce inner-urban smoke, or 1735 as well as 1845 in Prussia in terms of trading regulations) nature protection spread in this Century:</p> <p style="text-align: center;">1900-1918</p> <ul style="list-style-type: none">- The terminus 'Protection of native country' ('Heimatschutz') coined by E. Rudorff (about 1900);- Prussian Office for Natural Monument Conservation (Arbeitsstelle für Naturdenkmalpflege, 1904);- German Association for Natural Monument Conservation (Deutsche Bund Heimatschutz);- In the 'Weimar Constitution' nature protection became a state obligation (1918); <p style="text-align: center;">1919-1935</p> <ul style="list-style-type: none">- First German National Park 'Lüneburger Heide'(1821);- German Law of nature protection (Reichsnaturenschutzgesetz 1935, in force till 1976); <p style="text-align: center;">1950-1969</p> <ul style="list-style-type: none">- Conference of Cultural Ministers of the 'Länder' agreed to nature protection (1952);- First university chairs for nature protection;- Law of protection and maintenance of native nature (Gesetz zur Erhaltung und Pflege der heimatlichen Natur, stating in 1954:<ul style="list-style-type: none">- nature protection a state obligation- cultural importance of nature conservation- consequences for national health and education- interrelating economy with protection; <p style="text-align: center;">1970-1990</p> <ul style="list-style-type: none">- New social relevance of nature and environmental protection, resulting from mass-media campaigning (1969-1971);- First environmental protection program of the federal government (1971);- Many local and regional citizen's action groups established;- National association of citizen's action groups (Bundesverband Bürgerinitiativen Umweltschutz, 1972);- National association for environmental and nature protection (Bund für Umwelt und Naturschutz, Deutschland, 1975);- German 'Greenpeace' section founded (1980);- The 'Greens' become a political party (1984); <p style="text-align: center;">Since 1990</p> <ul style="list-style-type: none">- New concepts for changes to an ecological society;- Controversies whether environmental protection should be part of the constitutional law.

* See Senent 1977; Schoenichen 1954; Zwanzig 1962.

In 1971 the federal government already regarded environmental consciousness, as an essential element of her first environmental policy programme. It demanded an integration of environmental topics in *teaching concepts*. Also teacher training was asked to integrate environmental education into their studies, and universities were encouraged to care for more interdisciplinary studies (Bundesregierung 1972). In the same year 78% of the German public responded to public opinion polls, that "air pollution becomes more and more dangerous to man" (Piel in press). According to the 1973

polls, pollution had become 'the most important problem, ahead of inflation, poverty and unemployment'. Even in the mid-70s, when economic and employment problems increased considerably, nature conservation and pollution control ranked among the three most crucial concerns (so in 1976 and 1978) (Fietkau, Kessel & Tischler 1982). In spite of the growing sensitivity with regard to environmental issues, its effect on ecological comprehension should not be overestimated (Langeheine & Lehmann 1986). During this period the overall focus was more or less exclusively on pollution problems and quick countermeasures, such as recycling.

Figure 1: Topicalization of Ecological Problems.



It was not until the *mid-70s* that pollution's effects on human health were discussed, that social and economic causes to environmental damage gained larger attention, and that more *comprehensive didactic concepts* were

demanded (including medical, juridical and political dimensions) in order to 'regain ecological reality' for the teacher (Bundeszentrale für politische Bildung 1974, pp. 9, 52ff.). Particularly political subjects and sciences were called upon to transcend subject specific aspects and to integrate various dimensions in environmental education. But neither at the university nor school levels were the social sciences really ready for such a guiding function. A conceptual framework hardly existed, as how to teach ecological relations in an interdisciplinary way until the later 80s (Bolscho 1979, pp. 69ff.; Seybold 1979, pp. 699ff.). Accordingly, about two-thirds of all topics concerned with environmental problems in the lower secondary school (Sek. I) fell in the domain of biology and geography during those years (Fortriede 1981, pp. 173ff.).

This led to an agreement of the standing conference of the Cultural Ministers of the 'Länder' (Kultusministerkonferenz = KMK) in 1980, asking that "the schools, must foster in young people an awareness and a sense of responsibility for their environment and should favourably influence their out-of-school attitudes" (KMK 1981). With this aim in mind, the KMK favoured an integrative approach, recommending for instance, a subject-bridging *teaching principle* for environmental education. Beyond this, it stressed i.e.: that students need to recognize the interrelations between ecological, economic, and social influences; that they should learn to reflect on personal, local, and international effects on environmental systems; and that they should recognize competing social interests as well as their own responsibilities for future developments (KMK 1982, pp. 3, 5, 11f., 1986).

In the face of all these demands, environmental education became rather complex and even more difficult to teach. Figure 2 summarizes as well the context, as the *development in environmental studies*, so that it becomes obvious, why environmental education cannot be limited to the protection of nature, or pollution information. In fact, an ecological dimension in education and a somehow ecological education process was necessary (Bronfenbrenner 1976; Schleicher 1987, p. 23).

Figure 2: Development of Environmental Education.

Structural-Systematic Changes	Historical Development				
	1950	1960	1970	1980	1990
Awareness and dimensions of natural sciences	protection of nature and landscape	(pollution of soil, air, water)	system theory		
Additional aspects of media and politics		'Limits of Growth' change of public opinion citizens initiatives environmental programs of govr. constitut. protection			
Complementary social science dimensions		Man and Biosphere Baltic Sea Proj. Unesco Tiflis/München (global:local) human ecol. dimension			
Reactions and actions of educational policy	KMK 53 (nature protection)		Bundesz. 74 (pol. coordination)	KMK 82 (env. ed. criteria)	
Pedagogical concepts	biol./geogr. education (subject-specific didactic)	learning paths (biol.) subject integration action approach projects envir. ethics attitudinal change			
Environmental comprehension	symptoms information techn. repairment		networks princ. of causation taking precautions	sustainable environment	

However, a certain consensus was reached since the 80s, that *environmental education should pay particular attention:*

- to students' attitudes and interests, because their level of comprehension seems to increase with their concern;
- to an inclusive and integrating way of thinking, to problem-solving methods and to personal decision-making beyond the school walls;
- to interrelations of various social and economic subsystems with biotic and abiotic systems (Wissenschaftsrat 1994, pp. 3, 8, 21f.; Sachverständigenrat 1987, p. 53);
- and to values, considerate to the coexistence of man and nature (Braun 1983), respectively what lately has been termed 'sustainable development' (Engelhardt & Weinzierl 1993).

In general, more *integrative and situation-oriented approaches* were developed since the *mid-80s*. They still had to surmount considerable handicaps, due to the subject organization at the school and university levels and on behalf of great deficits in teacher training (Schleicher 1994, pp. 15 ff.; Lippke 1992). Moreover such integrated concepts were rarely based on *empirical evidence* or tested. It was not until 1989 that a working group of the IPN (Institut für die Pädagogik der Naturwissenschaften) at Kiel, started to bring empirical studies and results to the attention of a wider audience (Eulefeld 1992d, 1993). Their studies pointed out what students were interested in, where their knowledge needed to be extended, and - most importantly - how knowledge and experience were interrelated to behaviour, and respectively, to what extent verbalized and factual environmental behaviour matched (Langeheine & Lehmann 1986; Diekmann & Preisendörfer 1992). In these days curricula and teaching were still more often concerned with environmental facts than with the learners' perceptions and experiences. Generally little information existed about the environmental consciousness and attitudes of different age groups, or about the competing impact of socializing agents and mini-cultures (de Haan 1994).

All in all, the history of environmental problems shows, that they usually are not stated and controlled unless a people feels truly troubled by them (e.g. by damage to the forests, by dead seals at the beaches of the North-Sea, or by chemical pollutions as by Sandoz). The more the public became engaged, the more it demanded preparation of the young to cope with environmental challenges. This impact had two consequences: first, environmental education largely followed political and public discussions and time-specific priorities, and second, it had difficulties to inspire the young beyond public concern.

3 Environmental Education in the Social Context Since the Mid-80s

Since the *mid-80s* environmental attention turned in two different directions. Till 1990 many earlier initiatives accumulated, so that environmental education gained greatly. Afterwards, however, the silent revolution in Eastern Europe, Maastricht conflicts, and the growing immigration and rate of unemployment, withdrew attention from the environmental domain. In view of these changes the chapter will portray: first, developments in social contexts, progress in school teaching, and finally, deficits and reforms in teacher training.

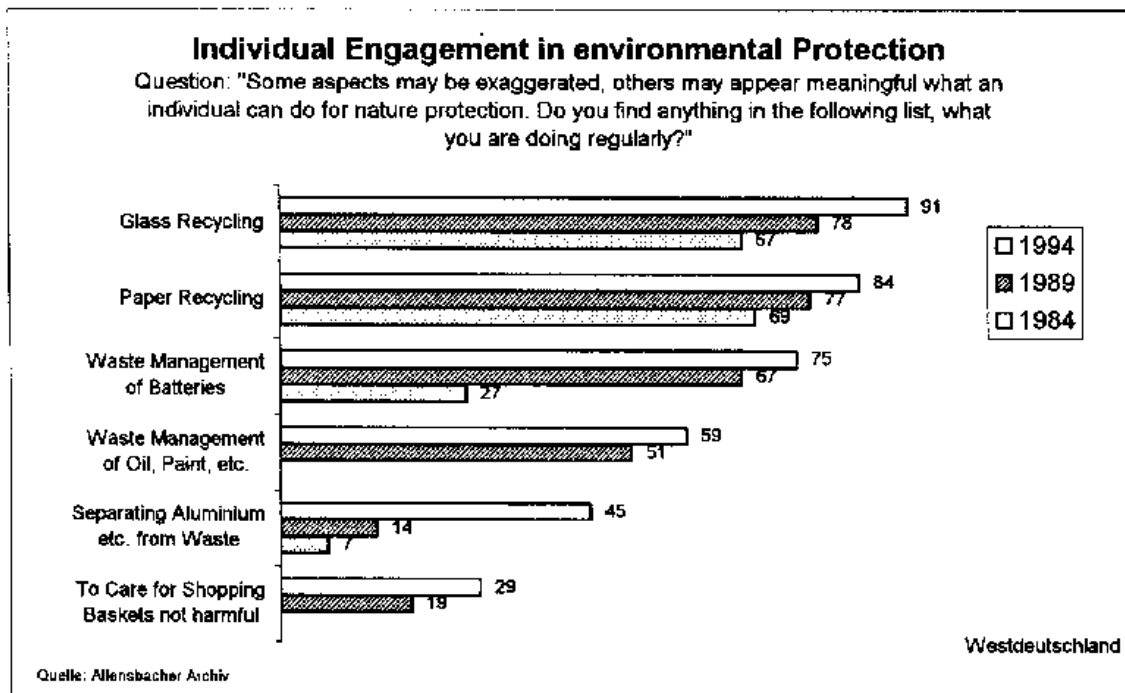
3.1 The Social Environment of Environmental Education Today

Today there are more than 100 *associations* pooled under the umbrella organization of 'German Nature Protection Association' (Deutscher Naturschutzring), which are also engaged in public opinion building (Eulefeld 1992a). Also many *TV-channels* broadcast half-hour environmental programmes in regular intervals, reflecting and stimulating scientific and/or political discussions. Since 1991 a *multimedia distance learning programme* on 'human ecology' (linking broadcasts with tutorials, study books, and background brochures to radio-programmes) is offered by seven German stations. The programme is directed as well to university students, adult classes as to groups of sixth-formers, all of whom could sit for external examinations (DIFF 1991).

In addition a considerable spectrum of problem-approaches, case-studies, field studies, and integrative *learning concepts* are developed for schools. Several of these aspects were merged in terms of situational, open-ended, and conflict oriented *didactic field strategies*, such as the 'Lernortdidaktik' (Schleicher 1992a, pp. 29-87) or a similar regional learning concept (Salzmann 1989). Some school administrations began simultaneously to allow more extra-time or extra-curricular activities for environmental education – preferably to comprehensive schooling. These trends were backed up by increasing trans-disciplinary studies at university and teacher training levels (Döbler 1994, pp. 277ff.). *Public awareness* of the need to recycle, and of political and legal developments in the protection of nature, reached its *peak in 1990* (Schleicher in press; Piel in press). But these public attitudes which influence parents, teachers, students, and the overall educational environment are not necessarily favourable to environmental education. Sometimes

considerable *dichotomies between public and expert opinion* exist (see Fig. 3 and Tab. 2), or short-term problems of the day dominate public concern far too much. In comparison to experts the public regards, for instance, 'breathing in gases from refueling' as the most dangerous aspects of traffic, or it sees health problems more due to poisonous waste or to radioactivity than to a shortage of exercise and smoking, despite death-risk statistics give opposite evidence.

Figure 3: Waste Management/Public and Expert Perceptions.*



* See Piel in press.

The opinion is widely held that our local environments are little endangered, but the global situation close to disaster. More than 50% of the West Germans regarded their local environment more or less intact, while 60% considered the overall national environment as quite endangered (Piel in press). These opinions spread, though pollution problems generally start as local problems and people tend to be more ready to act at this level (e.g. in terms of recycling, garbage segregation, or accepting higher consumer prizes for better food). Finally, it should be mentioned that *environmental engagement decreased* since 1990, because of other growing concerns, such as increasing crime and unemployment.

These contextual circumstances are highly important, because environmental education cannot be effectively discussed out of the environmental context, nor can it be very effective if irreconcilable differences exist between public and political priorities.

Table 2: Waste Management/Public and Expert Perceptions.*

What is Extremely Harmful for Our Health 1991			
Public Opinion		Expert Opinion	
poisonous garbage	81%	to smoke cigarettes	81%
asbestos	81%		
strong medicine	75%	too littel physical	71%
car - exhaust	75%	exercise	
polluted water	75%		
unprotected sex	71%	drinking strong	58%
with changing		alcohol	
partners			
atomic power	67%	fatty meals	42%
stations		eating too much	42%
to smoke	60%	car - exhaust	39%
cigarettes			

* See Piel in press.

3.2 Environmental Education in Schools

Environmental education rests largely with committed teachers and schools. It is more or less *prevailing opinion*, that it has to consider personally relevant problems, needs to be based on experimental and participatory learning, should bridge the gap between perspectives of natural and human ecology, and ought to aim at key-qualifications. Often however, the regular curriculum time for environmental studies is limited; school project are few, particularly at the upper grades, when teaching tends to be directed towards examining requirements; interdisciplinary learning is still not common (Lob 1986, pp. 11ff.; Klenk 1987, pp. 146, 151, 162ff.). Even young people relate environmental problems more to nature, forest, and landscape conservation than to social factors (Emnid 1985, pp. 7, 40f., 50). Nevertheless, the stress

changed from environmental to ecological education, and consensus grew in the 80s that more attention should be paid: to an inclusive and integrating way of thinking (Schäfer 1981, pp. 24ff.), to problem-solving methods and decision making beyond the school walls (Seybold 1979, pp. 699ff.), to anticipation of ecological problems (Heger et al. 1983), a redefinition of values in view of a considerate form of co-existence of man and nature (Braun 1983, p. 10), and finally, to students' attitudes and interests, because their environmental concern increased with their level of comprehension (ibid., pp. 36f., 47).

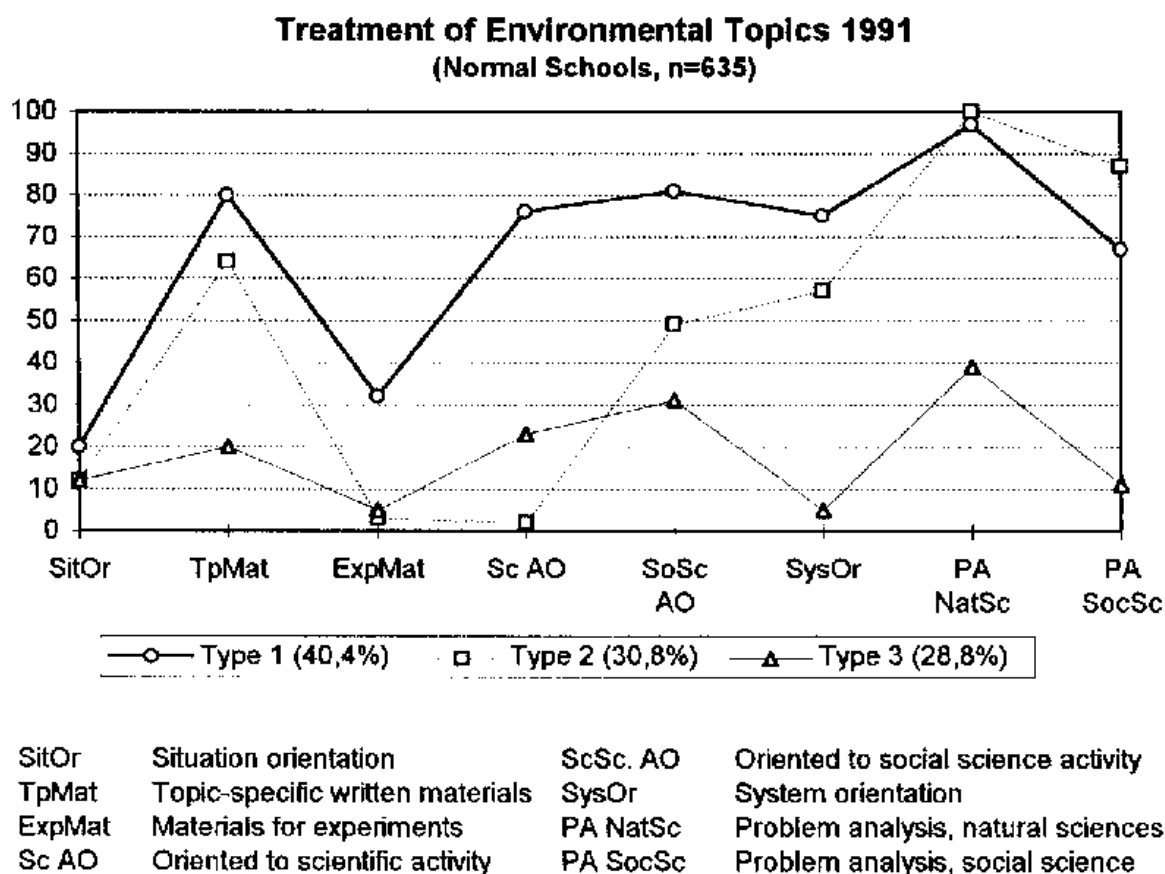
In general, the *situation improved* over the last years as an empirical follow-up study from 1985 to 1991 illustrates. It analyzed the situation in 60 schools (grades 4, 9, 12) in 1985 and 131 schools throughout Germany in 1991. According to the data, environmental projects are discussed over longer periods; meanwhile, appropriate didactic concepts are used by a growing percentage of teachers, and global aspects receive more attention than in 1985. Some important details of the rather elaborate, large scale research are summarized here:

- The percentage of *environmental topics* taught in biology, chemistry, geography, physics, and religion decreased from 80% in 1985 to about 53% in 1991, which indicates that other subjects – in fact more social sciences – participated. As far as content is concerned, the strong emphasis on air and water problems at about 27% in 1985, diminished to 16% in 1991, while the attention towards consumption and garbage problems more than doubled, increasing from 5% to about 11%.
- Also the *teaching structure* became more relevant in the way that interdisciplinary approaches gained popularity (with an increase from 16% in 1985 to 21% in 1991), that extended study-periods became more common. The percentage of those lasting three to five hours increased from 27% to 32%. Those with at least six hours more than doubled (from 3% to 8%) (Bolscho, Eulefeld & Seybold 1994, pp. 22ff.).

The most important changes appear, however, when calculated with regard to three types of 'latent classes'. A comparison of these types points to considerable *improvements in the teaching principles*. Over the six years the percentage of the 'type one' respondents, who stressed interdisciplinary, action- and problem-oriented as well as practical learning, rose from 15% to 40%, while the percentage of 'type two' teachers who treated environmental topics (including problem solving, etc.) primarily in verbal terms, decreased from 47% to 30%. The percentage of 'type three' colleagues, who used didactic methods with little relevance to problem solving, etc., dropped from

38% to 29%. Specific didactic concepts which were said to be used in 1991 are illustrated in the following table (Bolscho et al. 1994, p. 29).

Figure 4: Treatment of Environmental Problems.*



* Probability to which 15% of all topics were treated.

If the *situational approach* ranks top meanwhile (type 1 = 46,2%), there is some hope that students gain learner-, situation- and problem-relevant insight, at least in the limited time available for environmental education (Eulefeld 1992b, p. 30, 1992c, p. 141). Beyond this, another result of the study may be of interest. In order to review other results on the inconsistency between environmental information and stated behaviour, the study calculated teachers' statements. Grouped to certain clusters of variables, 62% of the teachers stated that they act in an environmental conscious way, while 38% did not. However, both groups emphasized that they cooperate in 'low cost' environmental projects, such as 'garbage separation', 'cooperation in projects', contributing to the 'protection of endangered species', etc., while at the same

time, being reluctant to change from private to 'public transportation' or to vote for a 'political group' that favours social change according to ecological demand (Eulefeld 1992b, p. 84f.). If the second area might be called 'high cost' area, then greater differences existed between the two groups only in the middle range. If these preliminary results are confirmed in the future, then even those *teachers* who use more adequate didactic principles in environmental education *do not live up to what they teach*.

On the whole, integrated and action oriented studies have become more common over the last years, and the social sciences take a greater share in environmental education. Typical is the stress on environmental learning in relevant learning environments (cf. 'Lernortdidaktik'), since such integrative studies of interdependent socio- and biotopes offer themselves for synthesizing experience and information. Moreover such studies are closely connected with the learners' experiences and are related to public opinion. They favour a resource-based learning, challenge assessments of different consequences, train transfer abilities and encourage involvement in wanted or unwanted developments. In spite of these developments, a large group of teachers still does not live up to these developments. They are not adequately trained and feel handicapped by school structures.

4 Problems in Teacher Training

Universities, colleges, and research institutes have played a central role in the development of *environmental concepts and teaching materials* since *the 60s*. However, integrative, systematic, and sequenced training concepts did not exist till today, despite the fact that environmental sciences demand multi- or interdisciplinary studies and environmental education is regarded as a teaching principle not be taught as a school subject. This situation is by no means accidental, as shown in the 700-page "Guide to Conservation Study Courses" of the Federal Environmental Protection Agency (UBA 1988), which compiled environmental courses according to disciplines. More in depth studies show that interdisciplinarity was already stressed in technical areas (from 1977 to 1982). Engagement of the *social sciences* did not grow till 1982, but is still small (Döbler 1994, pp. 297ff.) They should have had a central position, however, because "values, attitudes and behaviour of individuals, social groups and societies ... largely determine the relations between man and environment ..." (Wissenschaftsrat 1994, pp. 3, 8, 21f.; Sachverständigenrat 1987, p. 53). Since the 90s interdisciplinary dimensions

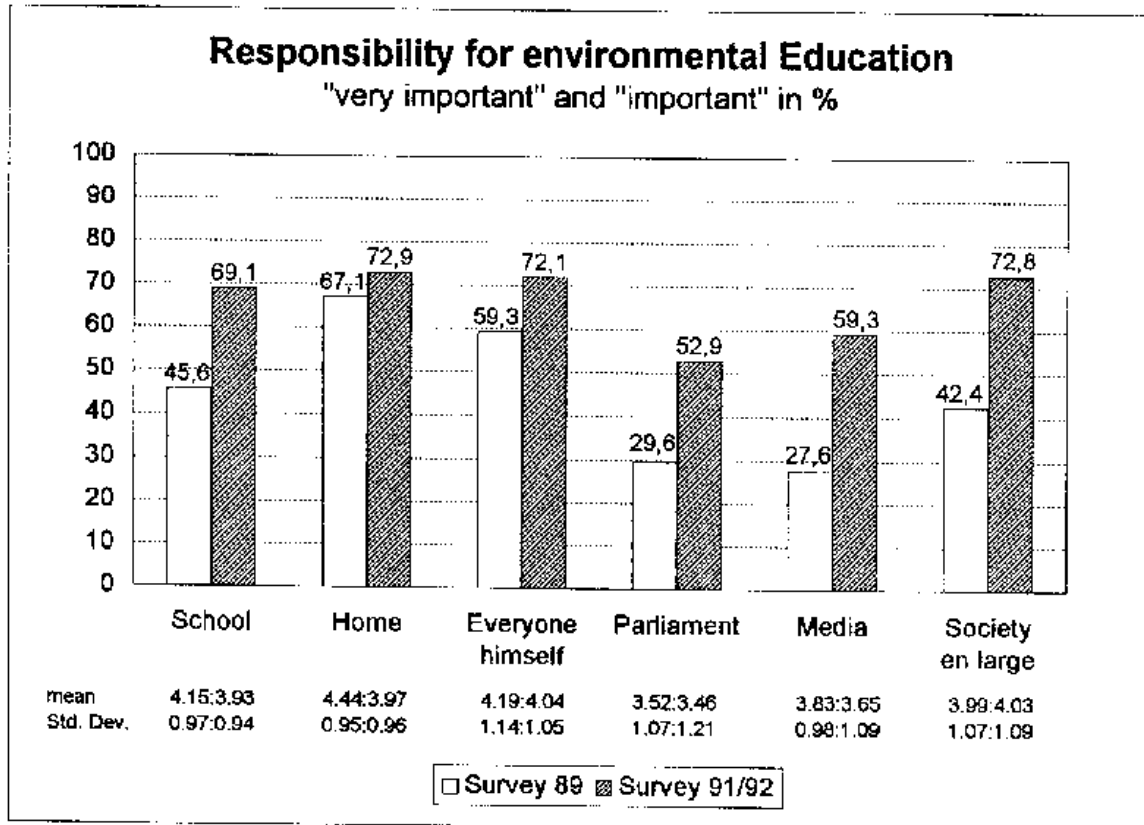
are now most common in studies which focus on ecological aspects. A *new impetus* may come from the reestablished universities in East-Germany. The technical university of Cottbus, for instance, established a faculty of environmental studies (including courses in informatics, law, planning, economy, and additional ecological as well as social dimensions), or the University of Erfurt, which prepares for several examinations in environmental education (i.e. for teachers, in adult education, or with regard to a magister exam). This reluctant development in teacher training somehow reflects a European deficit (Schleicher 1994, pp. 24ff.; Hellberg-Rhode 1992, p. 108; Leal Filho 1994).

Changes in teacher training are overdue, as has been pointed out by empirical studies (Bolscho et al. 1994, pp. 22ff.). According to teachers' views at Münster, about 57% (from different school types) feel handicapped by the principle of subject teaching and/or the missing minority time. These deficits were below average with primary school teachers and beyond proportion with teachers of Biology (i.e. in lower secondary schools). The later is surprising, because the subjects biology and geography were regarded as particular relevant to environmental education (Hellberg-Rhode 1992, pp. 83 f., 104). In addition another study in North Rhine-Westphalia shows that about a third of secondary-teachers at least cooperates with colleagues in environmental education, in fact about 50% in secondary modern schools, but hardly more than 10% from grammar schools, in face of the strong subject orientation (Krol 1991, p. 148). On the whole, no more than a quarter of interviewed teachers felt competent to teach environmental education, with 50% citing inadequate training as the cause. Therefore, even if interdisciplinary teaching at the school level has improved since 1985 (as has been outlined in the last section), it is still within reason that teachers demand more interdisciplinary training and that education-students plead for special university courses on environmental education (Hönigsberger 1991, cited from BLK 1991, p. 44).

A quick removal of the existing *training deficits* can hardly be expected (Kyburz-Graber 1993, p. 197), in spite of considerable environmental interest among students (Wissenschaftsrat 1994, p. 45). For, changes towards more integrated, systematic, and sequenced studies are handicapped by the discipline-orientation of university studies. University self-control also does not favour large changes at the expense of established teaching priorities and interest groups, and great administrative energy is required to change state regulations for the certification of teachers (Lübbe 1987, pp. 17ff.). In the face of these obstacles, it is easy to understand that changes have been quickest at the level of supplementary, in-service, and postgraduate studies, due to vocational demand and/or more structural flexibility (Döbler 1994, p. 297). For instance a 2½-year interdisciplinary in-service course for teachers has

been offered in Oldenburg since 1984. Since 1991 in Hamburg a preliminary two-semester course has been tested. And, repeatedly, follow-up studies have been organized in Ludwigsburg since 1992 (Eulefeld 1992a; Bolscho et al. 1994, pp. 43f., 47f.). But even here systematic concepts are more experimental than well tested.

Figure 5: Students Comprehension of Environmental Problems.



In order to develop more coherent and systematic *training concepts*, information is necessary with regard to environmental interest, knowledge, and attitudes of the students, but also with regard to the correspondence between professors' training intentions and students' awareness of them. According to empirical follow-up studies at Hamburg University (from 1989-1992), *students' ideas* of environmental damage, reasons for it, and options to reduce it are often at least inhomogeneous, if not inadequate (see Fig. 4). These discrepancies are not much smaller with older students in higher semesters. This points to the need of more systematic sequencing in training.

Moreover, the staff's intentions for the courses and students' awareness of their goals differ considerably. These discrepancies lay in several different causes: courses are not interrelated in training schemes; the goals are not

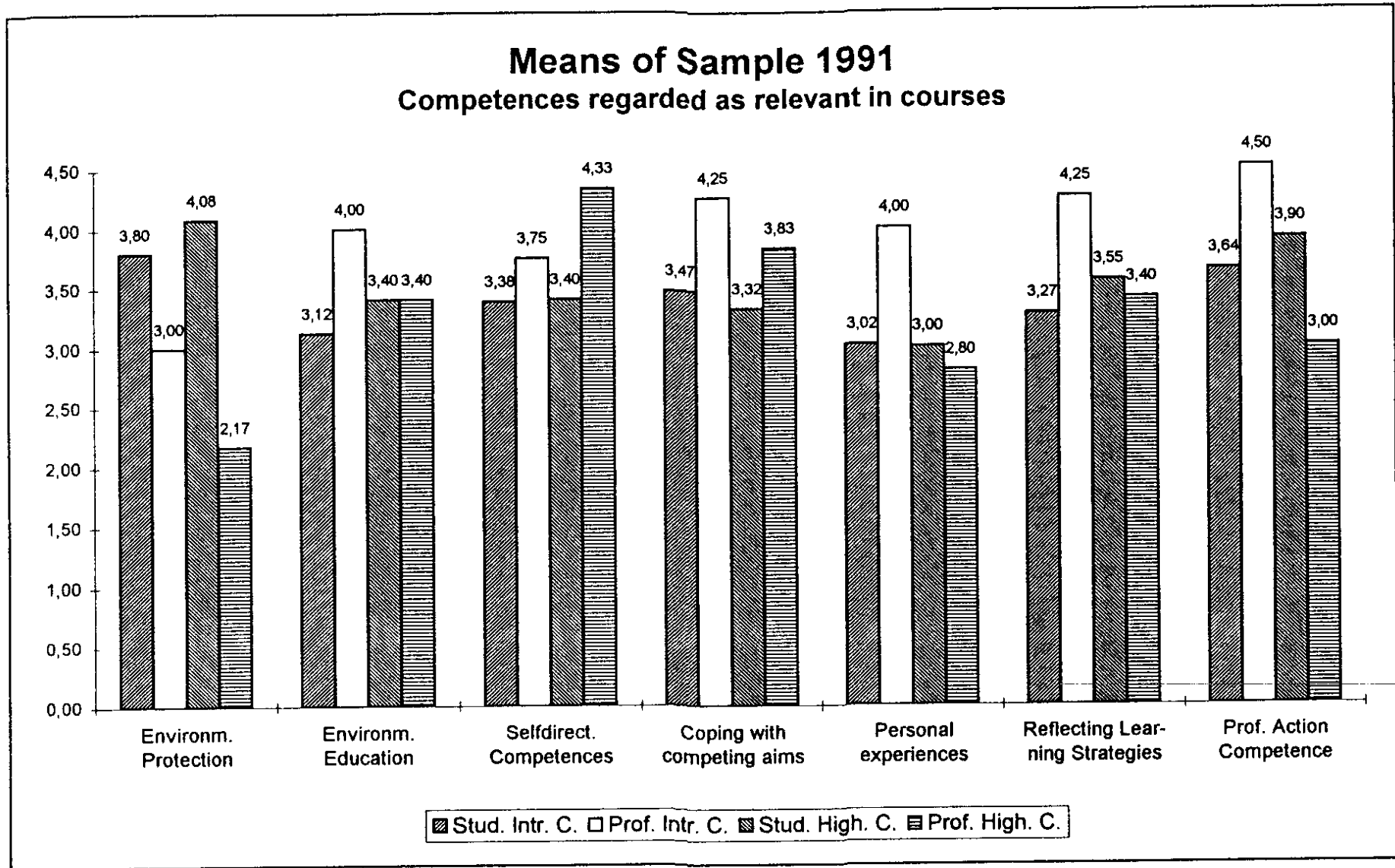
clearly pointed out at the beginning of the seminars; the participants may sway the learning process into unplanned directions; and/or students do not comprehend what is actually being taught. In any case, the *didactic challenges to university teaching* are too little explored and reflected, so that environmental training suffers from a cleavage between course planning and course perception. A few of these discrepancies are highlighted by Figure 6 (Schleicher 1994, pp. 121ff.). Obviously a good part of students is ill prepared to take part in the classes, if the staff is little aware of the students' information about and comprehension of environmental problems.

On the whole teacher training for environmental education is simultaneously met with the following *problems which are closely interrelated*:

- *Didactic teaching problems* at university level, because students' engagement, comprehension and qualification are too little taken into account, teaching is too much directed towards facts and too little concerned with paradigms or with conflict and decision making; in fact an ecological adequate learning process and climate is rare;
- *conceptual problems*, because single courses tend to emphasize either dimensions of nature or human ecology (due to staff competence); an ecological integration of subject related didactics is still in its experimental stage;
- *administrative problems* to organize for relative small numbers of students with different vocational goals more interdisciplinary and coherent study sequences, because curricula change demand simultaneous changes of state and/or university certificates; and finally budget cuts over the last years make cooperation amongst faculties and planning of new study concepts more difficult.

Since 1994 a federally supported *research project on teacher training* was begun which shall cope with some of these problems. The project will link training facilities at the Hamburg and Erfurt Universities and develop interdisciplinary training modules. This concept tries to interrelate flexibility with systematic coherence. It offers students more opportunities to sequence specific modules according to their academic and vocational goals, allowing them to annex new components to traditional study requirements, without overall curriculum changes and extra cost (Schleicher 1994, pp. 34ff.).

Figure 6: Students' Evaluation of Seminar Planning.



5 Outlook

Considerate for improvements in environmental education some *fundamental problems* will be pointed out: which are open for debate, which need more research, effect teacher training, and will have considerable meaning for practical work at the schools' level.

Till today, environmental education generally *reacted* to media and research impact on politics, as well as on public opinion. It was all the more functional to such short term demands the less it was geared towards a preparation of extrafunctional key-competencies, respectively the less long term sustainability had been the main target. This is obvious from the early developments.

After the great increase in pollution consciousness of the public in the *early 70s*, environmental aspects were quickly added to several school subjects. But it was not until the *late 70s* that more student relevant experimental, project, and situational work came to the forefront, backed by educational politics and welcomed by the public. Then, the more or less pragmatic changes at school level got more academic stimuli and sometimes guidance. So multi- and interdisciplinary teaching spread in the late 70s, in spite of considerable deficits in teacher training.

Fundamental problems, however, are still at debate. For too long scientifically generated knowledge about the environment was of prime concern in schools and teacher training. Meanwhile *ecological research stressed* the need to consider the relationship between different natural and social systems and their contexts. In educational terms, the awareness increased that it is at least equally important to consider in which way this knowledge is absorbed, taught, and evaluated in terms of life experience. Generally more attention needs to be paid to the various channels of communication enabling research, politics, and education to understand how environmental literacy is generated and transformed.

Today educational research, agencies of curricula development and teacher training are more or less aware:

- Environmental education demands an inner school reform and vice versa, because *environmental education and educational environments* are interdependent. It has become clear that environmental behaviour is more determined by personal experiences than by knowledge, and stronger influenced by home and local conditions than by school teaching (Langeheine & Lehmann 1986, pp. 74, 113ff., 125, 133). Accordingly, environmental education needs to relate teaching to out-of-school

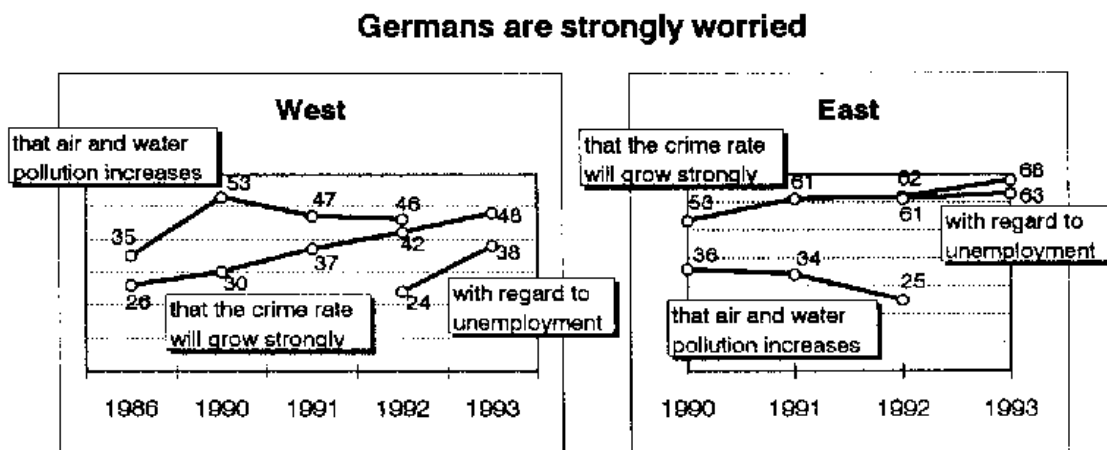
- situations and experiences, and to care for mini-cultural contexts and conflicts (Haan 1994).
- Thus, scientific knowledge cannot simply be transferred to the learner as in the past, but *an environmental learning process* has to be initiated that leads to environmental competence. Certainly this process has to be based on scientific knowledge as well of the environmental sciences as those relevant to learning. The later tells us, how children experience nature and environmental problems, what system of values has already been developed, and how environmental comprehension and competence can be expanded. Of utmost importance here are the individual's ability to anticipate future challenges and to cope with value based decisions.
 - It is widely accepted that environmental *sustainability and the principle of retinity* demand an understanding of complex, partially intransparent, multi-faceted, and momentum gathering constructions of reality. This means, that no single environmental problems and/or solutions shall be stressed, but rather that the learner can interrelate subsystems and reflect over the used methods, paradigms, and value implications. Lately, for instance, health and environmental education are linked under the concept of sustainable development (Brößkamp 1994), and problems of local vs. global decision making were discussed in the field of political action (Claußen 1993).
 - Surely conflicts between perceived demands, intended solutions, the economic as well as political constraints have to be included. The *ethical implications* cannot be ignored, considering the major causes of the environmental crisis are due to value orientations and man's neglected responsibility for preserving life-supporting systems. Perhaps the most important *ethic for survival*, is one which demands individual and social abilities to evaluate one's own self-concepts, behaviour and decision making; that means as well social attitudes of interdependence, belonging and sharing on a global scale are necessary (Coenen et al. 1972) as an orientation for 'peace with nature' (Meyer-Abich 1984; Heger et al. 1983).

In the future environmental education will demand further specification as to which ecological information, principles, and problems are particular relevant in the educational process; moreover, which teaching and learning strategies are best suited to acquaint with overlapping epistemological interests and paradigms of human and nature ecology and their interdisciplinary application. In order to *identify, legitimize, and teach with regard to environmental key-qualifications*, the following questions must be answered:

- What are the consequences for an educational *theory and training* which must interrelate well-based facts with anticipatory calculations, related to a 'sustainable' ethos, and view environmental education, as well as training content, as a training principle and result?
- What are the *didactical implications* for university teaching and teacher training, that environmental learning has to be perceived as an always uncompleted process, acquaint with considerable 'uncertainties', demand greater student participation, and require self-evaluation?
- How do structures of the sciences, examinations, vocational expectations, and life experiences influence the environmental awareness and study interest of the learners?
- In which way are students willing and able to change their environmental comprehension and attitudes according to explicit and implicit learning-strategies and -fields?

All in all, environmental education made *great progress* over the last twenty years. Meanwhile, education towards nature conservation changed first to environmental education, in its narrow sense, before broader ecological dimensions were included. The new learning concepts, strategies, and processes are increasingly multi- or interdisciplinary, related to life experience, and accompanied by structural school reforms. Partly educational research, curricula development, and teacher training are well interrelated. Generally, however, considerable deficits still exist in teacher training.

Figure 7: Late Changes in Public Opinion.*



* See Piel in press.

Over the past few years environmental education has been faced with *great draw backs*. Further development - to clarify ecological learning processes, to make the school learning more ecological in itself, to extend the environmental consciousness and responsibility of the public, and to work towards a broader political consensus in the country - is considerably handicapped, because political and public interest turned to other priorities. Since 1989 the silent revolution in socialist countries, the unification of Europe and Germany, as well as problems linked with the depression and unemployment, became the main concern in the country. Accordingly, the financial resources for educational, political, as well as public backing of environmental education decreased. How this influences paid attention to environmental priorities in the Eastern and Western parts of Germany, is well illustrated by data from public opinion polls (see Fig 7).

However, the *impact of educational processes* on changing environmental consciousness and behaviour should generally not be overestimated; intentional education always has to compete with other agents of socialization.

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