
The state of environmental education in Polish and Czech universities

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Abstract: An appropriate university education is necessary to improve our environment. In consideration of this, an analysis of the syllabi of the Polish and Czech universities, focusing on the topics of environmental management and the protection of nature, was conducted by the International Graduate School IHI Zittau's Faculty of Business Administration. The results of this analysis can be compared with the situation at several Czech and Polish universities which offer environmentally-oriented subjects but tend to mention problems in environmental management only marginally. An international comparison in the form of a strength/weakness analysis in these countries has been conducted.

Keywords: Environmental education; environmental management; university; curricula analysis; international comparison.

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1 Introduction

Social development in the Middle and Eastern European Countries such as Poland and the Czech Republic has been characterised by political change towards democracy, a deep change in economic structures, and numerous other political and legal reforms. This restructuring has reduced industrial overcapacities, has modernised firms and therefore has significantly contributed to limiting the negative impact of industry and agriculture on the environment. But not all industrial sites have been cleaned up and the emissions have not decreased to the average of OECD countries [1, p.11]. The existing environmental problems as well as the related demand for environmental technologies and professional staff to introduce environmental management to firms require the qualified and target-oriented education of professionals.

A precondition for the implementation of environmentally orientated principles is a far reaching rethinking of many areas of human activity. Research in psychology, pedagogy and environmental policy has demonstrated that environmentally friendly behaviour is strongly linked with environmental knowledge and a positive attitude towards the environment or environmental consciousness [2, p.36]. In this context, environmental education has gained a high importance, especially in research and teaching at universities. Here, future leaders in politics, the economy and sciences are trained. It is they who have to confront the challenges of the sustainability concept [3, p.14].

It is only possible to adapt education to these needs in the middle or long run. But in the short run, the education at Polish and Czech universities is characterised by dynamic tendencies to increasingly include the challenges of sustainable development into knowledge transfer. Given this background, it was interesting to conduct an empirical

and comparative study of the status of the environmental education at Polish and Czech universities. The aim of the study was:

- 1 to find out to what extent environmental aspects are integrated in teaching
- 2 to elaborate on *commonalities* and *differences* regarding the intensity of the environmentally-oriented teaching at Polish and Czech universities. It should be established if possibilities exist to bundle the strengths and to decrease the weaknesses within the framework of the curriculum. At this point, the authors thank Mr. Jiri Sucharda for his support in conducting the research at Czech universities and in compiling the results. We also conducted an analysis of environmental education at German universities. We limited our research only to programs in economics and business administration at German universities, comprehensive universities and universities of applied sciences due to the high number of universities incorporating environmental issues in their academic programs (170 programs outside the field of economics at universities and 120 programs outside the field of economics at universities of applied sciences) and because of personnel and financial constraints. The results of the German study are published in Rheinländer and Kramer [4]. For this reason the results of the two studies cannot be compared, but they can be used for developing a boundary-spanning curriculum.

2 Database: obtaining and evaluating data

In order to obtain the most comprehensive picture of the state of environmental education, we included in the study all universities, economic universities, graduate schools and private universities whose profiles contain environmental aspects. Very specialised programs such as nuclear power or environmental protection and foundry technology were excluded from the study. We also did not include postgraduate programs although we recognise that their importance e.g. in Poland, is increasing. An example is the European Institute for Postgraduate Education at the University of Technology Kielce, offering interdisciplinary courses on the environment. It was not necessary to limit our analysis only to universities offering economics and business administration because of the small numbers involved (in Poland 13 and in the Czech Republic 8).

In total, we analysed the educational programs of 38 Polish and 18 Czech universities (Table 1). We would like to point out, that universities could be counted twice, if:

- 1 one university offers different programs, or
- 2 offers different specialisations, compulsory courses or optional courses in one program, or
- 3 offers environmentally-oriented courses for different programs (51 in Poland and 45 in the Czech Republic).

Table 1 Number of universities analysed

<i>Poland</i>		<i>Czech Republic</i>	
<i>Type of university</i>	<i>Number</i>	<i>Type of university</i>	<i>Number</i>
Universities	10	Universities	10
Universities of technology	13	Universities of technology	2
Universities of economics and business administration	6	Universities of economics and business administration	1
Private universities and others	9	Private universities and others	5
Total	38	Total	18

Source: International Graduate School Zittau

In order to conduct the analysis and evaluation of the educational programs using sustainability criteria and comparing Poland and the Czech Republic we developed uniform criteria for the analysis. According to the targets of the analysis the criteria refer to the *integration of environmental education into the programs* (name of the university, faculty, program) and to link the content of education to specified courses such as environmental policy, environmental law, environmental management instruments (Table 2). The derived data from the university survey were structured and evaluated regarding these criteria.

Table 2 Criteria for evaluation

<i>Criteria for Evaluation</i>	<i>Operationalised by:</i>
General information about the investigated universities	<ul style="list-style-type: none"> • Name of the university • Faculty/ Department • Program • Integration • Environmentally-oriented course
Content of courses	<ul style="list-style-type: none"> • Type of course • Environmental policy • Environmental law • Economy/Ecology • Strategic Environmental Management • Environmental management instruments (input-output-analysis; LCA; environmental cost accounting; EMAS; Eco-controlling; Eco-labelling) • Environmental management systems • Environmental technology (waste; energy; water; soil; air) • Environmental informatics • Operative environmental management (products; procurement; production; marketing; logistics; organisation; human resource management; finance) • Environmental psychology • Global environmental problems • Local environmental problems • International orientation (Czech Republic – Germany; Poland – Germany; Western Europe; other parts of Europe; USA)

Source: International Graduate School Zittau

The *database* – a compilation of universities and institutions of higher education with environmentally-oriented programs – stems from the Study guide in Poland [5] and from two information brochures in the Czech Republic [6,7] (Table 3). We sent a letter to universities asking for information. This information (brochures, leaflets) was entered into an access database following the above standardised criteria and the information obtained was evaluated. We would like to thank Mr. Markus Lehmann for building up and maintaining the database. The obtained information was not sufficient to cover all criteria of the database and so the database was extended.

We complemented the database by visiting internet pages, interviews (mostly telephone) with the corresponding persons at the universities (Table 3) based on a standardised questionnaire (see Appendix 1). In addition, we included universities into our database that were recommended in our interviews.

After processing all available information following the database criteria, an evaluation of the data was undertaken. The data set was sent to the corresponding university, which was asked to correct and complete it (Table 3).

Table 3 Origin of the data material

<i>Poland</i>	<i>Czech Republic</i>
	<i>Database</i>
Study guide	Information brochures about higher education institutes and universities
	<i>Complementary data</i>
Internet	Internet
Telephone and personal interviews	Telephone and personal interviews
	<i>Evaluation of data</i>
The universities corrected the data	The universities corrected the data

Source: International Graduate School Zittau

The data relate to the period from the summer term 1998 to winter term 1999/2000. Due to continuing developments in the area of environmental education, this data cannot be regarded as definitive but it does provide a useful picture of the state of environmental education in the universities concerned, therefore we would like to ask our readers for critical hints regarding changes or completion. In the following, we present the results of the analysis using the above presented criteria.

3 Characteristics of environmental education in Poland and the Czech Republic

3.1 Universities with an environmentally-oriented profile

Firstly, we distinguished between different types of universities (university, university of technology, university of economics and business administration, private universities and others). Among the 38 Polish and 1 Czech universities with environmentally-oriented programs we mainly found universities and universities of technology (Table 4).

Table 4 Differentiation of the environmentally-oriented universities

Type	Name/Location of Polish Institution of higher education	No.	Name/Location of Czech Institution of higher education	No.															
Universities	Schlesische Universität Jagielloner Universität Marie Curie-Sklodowska Universität Warschauer Universität Mikolaj Kopernik Universität Universität Opole Universität Wrocław Universität Poznan Universität Gdansk Universität Lodz	10	Mendel Universität für Landwirtschaft Brno Südböhmische Universität České Budějovice Jan Evangelista Purkyně Universität Usti n/L Karlsuniversität Praha Landwirtschaftliche Universität Praha Universität Olomouc Masaryk Universität Brno Westböhmische Universität Plzeň Universität Ostrava Universität Pardubice	10															
	Universities of technology		Schlesische TU in Gliwice/Schlesische TU in Katowice University of Mining and Metallurgy Technische Universität Bialystok Technische Universität Czestochowa Technische Universität Gdansk Technische Universität Krakow Technische Universität Lodz Technische Universität Poznan Technische Universität Rzeszow Technische Universität Warszawa Technische Universität Wrocław Technische Universität Zielona Gora		13	Technische Universität Ostrava Technische Universität Liberec	2												
						Universities of Economics and Business administration		Wirtschaftsuniversität Wrocław Wirtschaftsuniversität Jelenia Gora Wirtschaftsuniversität Krakow Wirtschaftsuniversität Poznan Wirtschaftsuniversität Katowice Hochschule für Handel in Kielce	6	Wirtschaftsuniversität Praha	1								
										Private universities		Fachhochschule für Umweltschutz in Bydgoszcz Hochschule für Fremdsprachen und Ökonomie Hochschule für angewandte Informatik und Management Hochschule für Ökologie und Management in Warszawa Privathochschule für Umweltschutz in Radom Humanistische Hochschule in Pultusk Hochschule für Management in Olsztyn	7						
														Other		Hochschule für Landwirtschaft Hochschule für Pädagogik	2	Hochschule für Technik Brno Hochschule für Chemie und Verfahrenstechnik Praha Militärhochschule in Vyškov Hochschule für Technik Praha Hochschule für Pädagogik Hradec Králove	5
																		<i>Total</i>	

Source: International Graduate School Zittau

We can state, that theory-oriented universities as well as practically-oriented universities of technology and universities of applied sciences offer environmentally-oriented programs.

The third criteria for evaluating environmentally-oriented education at Polish and Czech universities is general information about the university. We found that at 38 Polish universities, 41 faculties and departments put environmentally-oriented issues on their agenda. Twenty out of 38 have courses or programs directed to a more technically-ecological education, 15 to aspects of business administration and six to interdisciplinary topics. In the natural sciences, faculties and departments such as chemistry and environmental engineering dominate (Table 5). In the Czech Republic, 23 out of 42 faculties are directed to aspects from natural sciences and environmental technology (biology, chemistry, technical environmental protection), eight to economic aspects of environmental protection, and three to social aspects. We were not able to apply our criteria to eight universities based upon the information provided by them (Table 5). Generally, we find that education in the Czech Republic has a profile focusing on natural sciences.

Table 5 Classification of the faculties in Poland and the Czech Republic

<i>Class (total)</i>	<i>Faculty/department (numbers) (PL)</i>	<i>Faculty/department (numbers) (CZ)</i>
Economics and business administration (PL 15/CZ 8)	Engineering and economics (1) Administration and law (1) Informatics (1) Management (3) Mathematics, physics and technology (1) Economy (3) Ecology (1) Organisation and management (2) Regional economy and tourism (1) Environmental protection (1)	Faculty for business administration (1) Faculty for economy and administration (1) Faculty for informatics (1) Faculty for management and economics (1) Faculty for economics (1) Economic faculty (3)
Natural sciences (PL 20/CZ 23)	Construction and sanitary engineering (1) Construction and environmental engineering (3) Biology and environmental protection (1) Chemistry (5) Chemical technology (1) Geology (1) Geology, geophysics and environmental protection (1) Mathematics, physics and chemistry (1) Process and environmental engineering (1) Environmental engineering (1) Environmental engineering and energetics (1) Environmental protection (3)	Faculty of agronomy (2) Faculty of biology (3) Chemical technological faculty (2) Faculty of chemistry (1) Faculty of environmental protection (2) Mining-geological faculty (2) Faculty of environment (4) Faculty of chemical and process engineering (1) Agricultural faculty (1) Faculty of natural sciences (4) Technical faculty (1)
Interdisciplinary (PL 6)	Biology and geography (1) Interfaculty studies of environmental protection (2) Management (Professorship for economics and natural resources (1) Ecology (1) Ecology and environmental protection (1)	
Social sciences (CZ 3)		Pedagogical faculty (2) Faculty of socio-economic (1)
Not classified (CZ 8)		Faculty of machine tool engineering (3) Electrotechnical Faculty (2) Faculty of metallurgy and logistics (1) Faculty of Law (2)

Source: International Graduate School Zittau

At the moment, technical environmental protection within the framework of engineering or natural sciences is mainly implemented. General environmental protection dominates. Programs such as environmental management have been offered in Poland and in the Czech Republic for a short time. Therefore a need for an international exchange of experiences and research activities exists in this area. A similar situation exists at private universities in Poland, even though they have included environmental aspects into teaching in a clearer and broader manner. We can observe the range of the environmentally-oriented education not only on the basis of the programs but also on the basis of the courses and their integration into the programs. Within the framework of this investigation we distinguish between programs, specialisations, and compulsory and optional courses (Table 6). We can see that specialisations play an important role in Poland compared with the Czech Republic. Optional courses play virtually no role. We could conclude from these facts that students have little interest voluntarily gaining knowledge in environmental courses.

Table 6 Classification – type of studies

Classification	Type of studies							
	Own Program		Specialisation		Compulsory course		Optional course	
	PL	CZ	PL	CZ	PL	CZ	PL	CZ
Natural sciences	-	16	24	7	-	1	-	1
Economics and business administration	-	2	11	1	5	3	-	3
Interdisciplinary	1	-	9	-	1	-	-	-
Social sciences	-	1	-	-	-	1	-	1
Not classified	-	2	-	4		1	-	1
<i>Total</i>	<i>1</i>	<i>21</i>	<i>44</i>	<i>12</i>	<i>6</i>	<i>6</i>	<i>0</i>	<i>6</i>

Source: International Graduate School Zittau

In order to give a more detailed overview, we present some topics of environmental protection and show how they are taught at universities. Classifying the courses, we numbered the courses (the numbers are in brackets). These numbers are used in Table 8 for identify the content of studies. Roman numerals are used if at one university more than one faculty is considered.

In both Poland and the Czech Republic, the focus of environmentally-oriented courses is on technical and natural sciences subjects as shown in the Table above. We also find, that economic aspects are only considered to a low degree in cases where courses in natural sciences are offered e.g. at Polish universities. In other cases, where specialisations exist they mostly focus on environmental protection, water and soil protection and seldom on environmental management in firms (e.g. at the Humanistic School in Pułtusk, the University of Applied Sciences for Environmental Protection in Bydgoszcz and the School of Commerce in Kielce).

In the Czech Republic many courses have different names but have a similar content such as courses introducing environmental protection, basics of ecology, ecology etc. These courses are designed using similar concepts.

Table 7 Selected topics in programs, specialisations and compulsory courses

<i>Name</i>	<i>University (Code)</i>	<i>No.</i>
<i>Independent programs in Poland</i>		
Interfaculty studies for environmental protection	Warschauer Universität II (36)	1
<i>Independent programs in the Czech Republic</i>		
Waste management	Mendel Universität für Landwirtschaft Brno (22)	1
Applied ecology	Südböhmische Universität České Budějovice (25)	1
Chemistry and technology for environmental protection	Hochschule für Technik Brno (5) Hochschule für Chemie und Verfahrenstechnik Praha (2)	2
Environmental management	Jan Evangelista Purkyně Universität Ustí n/L (10)	1
Ecology	Südböhmische Universität České Budějovice (26)	1
Ecology and environmental protection	Karlsuniversität Praha (15) Westböhmische Universität Plzen (40)	2
Economics and environmental protection	Militärhochschule in Vyškov (24)	1
Organisation and administration of environmental protection	Jan Evangelista Purkyně Universität Ustí n/L (11)	1
Technology and techniques for waste treatment	Landwirtschaftliche Universität Praha (17)	1
Environmental protection and education	Universität Olomouc (35) Universität Ostrava (36)	2
Environmental technology	Hochschule für Technik Praha (9)	1
Chemical and process engineering in environmental protection	Hochschule für Technik Brno (6)	1
Business informatics	Masaryk Universität Brno (20)	1
Local administration and environment	Masaryk Universität Brno (21)	1
Environment	Masaryk Universität Brno (19)	1
Environment in the industry	Technische Universität Ostrava (36)	1
Environmental technique	Technische Universität Ostrava (31)	1
<i>Specialisation in Poland</i>		
Atmosphere protection	TU Wroclaw (26)	1
Soil protection	TU Bialystok I (17)	1
Management and sustainable development	Hochschule für Landwirtschaft (5)	1
Management and environmental engineering	Wirtschaftsuniversität in Wroclaw (41)	1
Monitoring	TU Poznan (23)	1
Nature and landscape protection	Hochschule für Ökologie und Management (7)	1
Natural protection	Universität in Lodz (29)	1

Table 7 Selected topics in programs, specialisations and compulsory courses (continued)

<i>Name</i>	<i>University (Code)</i>	<i>No.</i>
Ecology and environmental economics	Wirtschaftsuniversität in Katowice (38)	1
Ecology and water protection	Universität in Lodz (29)	1
Ecological health	Hochschule für Fremdsprachen und Ökonomie(3)	1
Planning and environmental management	Universität in Lodz (29)	1
Conservation and design of landscapes	Mikolaj Kopernik Universität (12)	1
Urban and environmental management	Wirtschaftsuniversität in Poznan (40)	1
Environmental chemistry	Jagielloner Universität (10)	1
Environmental management	Fachhochschule für Umweltschutz in Bydgoszcz (1)	3
	Hochschule für Handel in Kielce (4)	
	Humanistische Hochschule in Pultusk (9)	
Environmental policy and management	Wirtschaftsuniversität in Jelenia Gora (37)	1
Environmental monitoring	TU Wroclaw (26)	1
Environmental protection	Privathochschule für Umweltschutz (13)	15
	Schlesische TU in Gliwice (14)	
	Schlesische Universität (16)	
	TU Czestochowa (19)	
	TU Gdansk (20)	
	TU Krakow (21)	
	TU Lodz (22)	
	TU Warszawa (25)	
	TU Zielona Gora (27)	
	Universität in Gdansk (28)	
	Universität in Opole (30)	
	Universität in Poznan (31)	
	Universität Wroclaw (32)	
	University of Mining and Metallurgy I (33)	
	Warschauer Universität I (35)	
Environmental protection and management	Hochschule für Management in Olsztyn (6)	2
	M.C.-Sklodowska Universität (11)	
Environmental technology	Hochschule für Landwirtschaft (5)	2
	TU Poznan (23)	
Analysis of environmental pollution	Universität in Lodz (29)	1
Water treatment and waste recycling	TU Rzeszow (24)	1
Water and soil protection	TU Wroclaw (26)	1
Water protection	Institute of Higher Education for Ecology and Management (7)	2
	Mikolaj Kopernik Universität (12)	
Water supply and wastewater treatment	TU Rzeszow (24)	1

Table 7 Selected topics in programs, specialisations and compulsory courses (continued)

<i>Name</i>	<i>University (Code)</i>	<i>No.</i>
<i>Specialisation in the Czech Republic</i>		
Waste management	Jan Evangelista Purkyně Universität Ustí n/L (12)	1
Chemistry and technology of environmental protection	Technische Universität Ostrava (32)	1
Diagnostics and technical means in ecology	Westböhmsche Universität Plzeň (40)	1
Energetics, electrotechnique and ecology	Westböhmsche Universität Plzeň (40)	1
Application of ecology	Landwirtschaftliche Universität Praha (18)	1
Environmental engineering	Universität Pardubice (37)	1
Landscape renewal	Jan Evangelista Purkyně Universität Ustí n/L (12)	1
Technology of environmental creation and education	Technische Universität Ostrava (21)	1
Environment in small areas and firms	Südböhmsche Universität České Budějovice (28)	1
Environmental protection	Universität Pardubice (37)	1
Ecology	Südböhmsche Universität České Budějovice (27)	1
Environmental economics	Wirtschaftsuniversität Praha (43)	1
<i>Compulsory courses in Poland</i>		
Industrial and environmental policy	Wirtschaftsuniversität in Krakow (39)	1
Informatics in the management of environmental resources	Hochschule für angewandte Informatik und Management (2)	1
Environmental management	Schlesische TU in Katowice (15) Hochschule für Pädagogik (8) TU Bialystok II (18)	3
Economics and environmental management	University of Mining and Metallurgy (II) (34)	1
<i>Compulsory courses in the Czech Republic</i>		
Applications of ecology	Landwirtschaftliche Universität Praha (18)	1
Introduction into environmental protection	Mendel Universität für Landwirtschaft Brno (23)	1
Ecology	Südböhmsche Universität České Budějovice (28)	1
Economics and policy of environmental protection	Jan Evangelista Purkyně Universität Ustí n/L (12) Technische Universität Ostrava (32)	2
Environment	Universität Pardubice (37)	1
<i>Name</i>	<i>University or institution of higher education (code)</i>	<i>No.</i>
<i>Optional courses in the Czech republic</i>		
Environmental assessment	Hochschule für Technik Brno (7)	1
Ecology	Hochschule für Pädagogik Hradec Králové (4)	1
Environment	Universität Pardubice (39)	1
Environmental economics	Technische Universität Liberec (29)	1
Environmental protection	Hochschule für Technik Brno (8)	1
Environmental law and policy	Karlsuniversität Praha (15)	1

Source: International Graduate School Zittau

3.2 Evaluation regarding the content of studies

Further, within the framework of our investigation we analysed the specific content of the courses at Polish and Czech universities and institutions of higher education (Table 8). The codes in the Table below were assigned to the courses listed in Table 7.

Table 8 Specific content of environmentally-oriented education in Poland and the Czech Republic

Content	University or Institution of Higher Education (Code)	
	PL	CZ
Environmental Policy (PL: 27/CZ: 26)	(1), (5), (6), (7), (8), (9), (10), (13), (15), (17), (18), (21), (22), (25), (26), (27), (29), (30), (31), (32), (34), (35), (36), (37), (38), (39), (40)	(1), (3), (6), (10), (11), (12), (13), (14), (16), (17), (19), (21), (24), (26), (28), (29), (30), (31), (32), (35), (37), (38), (39), (41), (42), (43)
Environmental Law (PL: 27/CZ: 41)	(1), (5), (6), (7), (8), (10), (12), (13), (15), (17), (20), (21), (23), (24), (25), (26), (27), (28), (29), (30), (32), (33), (35), (36), (37), (38), (40)	(1), (2), (3), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19), (21), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (32), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43),
Economy/Ecology (PL: 30/CZ: 26)	(1), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (16), (17), (18), (20), (26), (27), (28), (29), (30), (31), (32), (33), (34), (36), (37), (38), (39), (40), (41)	(1), (2), (3), (6), (7), (8), (9), (10), (11), (12), (13), (14), (17), (19), (22), (23), (24), (29), (30), (31), (32), (36), (37), (38), (39), (43)
Strategic Environmental Management (PL: 21/CZ: 16)	(1), (3), (4), (5), (6), (7), (8), (13), (14), (15), (17), (18), (22), (25), (28), (29), (30), (34), (37), (38), (40)	(6), (8), (12), (13), (14), (15), (20), (22), (23), (25), (29), (32), (37), (38), (39), (43)
Environmental Management Instruments: (PL: 10/CZ: 34)	(1), (8), (13), (26), (29), (34), (36), (38), (40), (41)	(1), (2), (3), (4), (6), (7), (10), (11), (12), (13), (14), (15), (17), (18), (20), (22), (23), (24), (25), (27), (28), (29), (30), (31), (32), (33), (34), (35), (37), (38), (39), (41), (42), (43)
Input-Output-Analysis (PL: 6/CZ: 30)	(1), (8), (18), (29), (36), (38)	(1), (2), (3), (5), (6), (7), (10), (11), (13), (14), (15), (17), (20), (22), (23), (24), (25), (28), (29), (30), (31), (33), (34), (35), (37), (38), (39), (41), (42), (43)
LCA (PL: 7/CZ: 26)	(1), (8), (13), (34), (36), (38), (40)	(1), (3), (5), (6), (10), (11), (13), (14), (15), (17), (22), (24), (25), (26), (27), (28), (30), (31), (33), (34), (35), (37), (38), (39), (41), (42)

Table 8 Specific content of environmentally-oriented education in Poland and the Czech Republic (continued)

<i>Content</i>	<i>University or Institution of Higher Education (Code)</i>	
	<i>PL</i>	<i>CZ</i>
<i>Environmental Cost Accounting</i> (PL: 7/CZ: 9)	(1), (8), (18), (29), (36), (34), (38)	(11), (13), (14), (22), (23), (24), (37), (39), (43)
<i>Eco-Controlling</i> (PL: 4/CZ: 4)	(1), (8), (34), (36)	(6), (24), (37), (43)
<i>Environmental Audit</i> (PL: 9/CZ: 18)	(1), (8), (13), (18), (26), (34), (36), (38), (40)	(6), (10), (11), (13), (14), (15), (20), (22), (23), (24), (28), (30), (31), (33), (37), (38), (39), (43)
<i>Eco-Labeling</i> (PL: 4/CZ: 19)	(1), (8), (34), (36)	(5), (6), (10), (11), (13), (14), (15), (17), (22), (24), (25), (28), (29), (37), (38), (39), (41), (42), (43)
<i>Environmental Management Systems</i> (PL: 10/CZ: 25)	(1), (6), (8), (11), (13), (18), (25), (34), (38), (40)	(2), (7), (8), (10), (11), (12), (15), (18), (19), (20), (22), (23), (24), (25), (26), (27), (28), (29), (32), (33), (34), (37), (38), (39), (43)
<i>Environmental Technology:</i> (PL: 29/CZ: 37)	(1), (3), (4), (5), (6), (7), (8), (10), (11), (12), (13), (14), (17), (19), (20), (21), (23), (24), (25), (26), (27), (28), (29), (30), (32), (33), (35), (36), (38)	(1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (42), (43)
<i>Waste</i> (PL: 20/CZ: 37)	(1), (3), (4), (5), (7), (8), (13), (19), (21), (23), (24), (25), (26), (27), (28), (29), (30), (32), (33), (36)	(1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43)
<i>Energy</i> (PL: 7/CZ: 35)	(1), (14), (20), (24), (25), (26), (33)	(1), (2), (3), (4), (6), (7), (8), (9), (10), (11), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (33), (34), (35), (37), (38), (39), (40), (41), (42), (43)
<i>Water</i> (PL: 23/CZ: 37)	(1), (4), (5), (6), (7), (8), (10), (12), (13), (19), (20), (21), (23), (24), (25), (26), (27), (29), (30), (32), (33), (36), (38)	(1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43)
<i>Soil</i> (PL: 19/CZ: 33)	(1), (5), (6), (8), (10), (12), (13), (17), (20), (24), (25), (26), (27), (29), (30), (32), (33), (34), (38)	(1), (2), (3), (5), (6), (7), (8), (9), (10), (11), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (43)

Table 8 Specific content of environmentally-oriented education in Poland and the Czech Republic (continued)

<i>Content</i>	<i>University or Institution of Higher Education (Code)</i>	
	<i>PL</i>	<i>CZ</i>
<i>Air</i> (<i>PL: 25/CZ: 37</i>)	(1), (4), (5), (6), (7), (8), (10), (11), (12), (13), (14), (17), (20), (21), (24), (25), (26), (27), (29), (30), (32), (33), (35), (36), (38)	(1), (2), (3), (4), (5), (6), (7), (8), (9), (10), (11), (13), (14), (17), (18), (19), (22), (23), (24), (25), (26), (27), (28), (29), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43)
<i>Environmental informatics</i> (<i>PL: 9/CZ: 14</i>)	(1), (2), (8), (23), (25), (29), (32), (34), (36)	(6), (9), (10), (11), (13), (14), (20), (24), (28), (29), (30), (33), (37), (43)
<i>Operative Environmental management:</i> (<i>PL: 11/CZ: 10</i>)	(1), (3), (5), (8), (13), (29), (34), (36), (38), (39), (40)	(6), (9), (14), (24), (29), (32), (37), (38), (39), (43)
<i>Products</i> (<i>PL: 4/CZ: 3</i>)	(8), (13), (29), (34), (38), (39)	(6), (29), (43)
<i>Procurement</i> (<i>PL: 2/CZ: 1</i>)	(8), (40)	(32)
<i>Production</i> (<i>PL: 4/CZ: 3</i>)	(8), (13), (29), (34)	(9), (32), (43)
<i>Marketing</i> (<i>PL: 4/CZ: 4</i>)	(3), (8), (34), (40)	(32), (37), (38), (39)
<i>Logistics</i> (<i>PL: 3/CZ: 1</i>)	(8), (13), (40)	(6)
<i>Organisation</i> (<i>PL: 3/CZ: 0</i>)	(8), (29), (40)	---
<i>Human Resource Management</i> (<i>PL: 1/CZ: 3</i>)	(13)	(37), (38), (39)
<i>Finance</i> (<i>PL: 10/CZ: 3</i>)	(1), (5), (8), (13), (29), (34), (36), (38), (39), (40)	(9), (32), (43)
<i>Environmental Psychology</i> (<i>PL: 11/CZ: 4</i>)	(1), (8), (9), (10), (18), (20), (28), (29), (32), (34), (38)	(1), (19), (32), (36)
<i>Global Environmental problems</i> (<i>PL: 11/CZ: 29</i>)	(5), (8), (13), (18), (26), (29), (30), (32), (34), (38), (41)	(1), (6), (9), (11), (13), (14), (15), (17), (18), (19), (22), (24), (25), (26), (28), (29), (30), (31), (33), (34), (35), (36), (37), (38), (39), (40), (41), (42), (43)

Table 8 Specific content of environmentally-oriented education in Poland and the Czech Republic (continued)

<i>Content</i>	<i>University or Institution of Higher Education (Code)</i>	
	<i>PL</i>	<i>CZ</i>
Local Environmental problems (<i>PL: 14/CZ: 24</i>)	(1), (3), (5), (8), (13), (17), (21), (26), (29), (32), (34), (38), (40), (41)	(1), (6), (10), (11), (13), (14), (15), (17), (18), (19), (22), (26), (28), (29), (30), (31), (32), (33), (35), (36), (39), (41), (42), (43)
International Orientation (<i>PL: 10/CZ: 4</i>)	(1), (3), (8), (13), (23), (25), (33), (34), (35), (36)	(6), (19), (24), (43)
Czech Republic – Germany (<i>PL: 4/CZ: 1</i>)	(8), (20), (33), (34)	(6)
Poland – Germany (<i>PL: 7/CZ: 0</i>)	(1), (3), (13), (33), (34), (35), (36)	---
Western Europe (<i>PL: 9/CZ: 1</i>)	(1), (3), (8), (23), (25), (33), (34), (35), (36)	(24)
USA (<i>PL: 5/CZ: 2</i>)	(13), (23), (25), (33), (34)	(24, 43)
Eastern Europe (Other) (<i>PL: 3/CZ: 1</i>)	(33), (34), (40)	(6)

Source: International Graduate School Zittau

The profile of the courses in both Poland and the Czech Republic is mainly directed towards environmental policy, environmental law, economy/ecology, and environmentally-oriented engineering. In the Czech Republic it is additionally directed towards global environmental problems and input-output-analysis. Less attention is given to the following areas: environmental management instruments and systems (with the exception of input-output-analysis, LCA and environmental audits in the Czech Republic), operative environmental management, environmental informatics and international orientation [8]. Other courses such as environmental ethics or environmental psychology should be more carefully examined. Normally, these aspects of environmental education pay more attention to the core of the subject. In the natural sciences, the focus of the education lies on technical environmental protection with an orientation towards waste, energy, water, soil and air. The range of transferred knowledge about environmentally-oriented topics in the different courses varies sometimes within the programs. In graduate studies, subjects are mainly offered which are closely linked to the specialisation [9]. Considering the diversity of the examined aspects in the national context, it is striking that an international orientation in topics of ecology-oriented economics and business administration is not provided to any great degree.

3.3 Strengths and weaknesses of environmental education at Polish and Czech institutions of higher education

The analysis showed that the profile of the environmentally-oriented content of studies can be divided into three basic areas:

- 1 environmental protection – specialisations: environmental protection, conservation, environmental chemistry, ecology and protection of water and so on
- 2 environmental engineering – specialisations: environmental technology, monitoring, water and waste treatment and so on
- 3 environmental management – specialisations: environmental management, environmental policy and management, environmental protection and management and so on.

It is clear that environmental education in Poland and the Czech Republic is technically-oriented (Table 9). In addition, some higher education institutes offer environmentally-oriented courses in several faculties. The same situation exists regarding specialisations, where environmental aspects are mentioned within the framework of different scientific areas. The interest of students in environmentally oriented studies is higher at universities of technology than at universities of economics and business administration. Environmental programs based on a technical education at technical universities are thought to be more relevant in the labour market. Within the framework of these programs, students learn about general ecology and environmentally-oriented technological processes.

The Polish experiences in the area of environmental education show that a theoretical approach towards these topics exists in various universities [10]. This partly reflects the respective scientific literature. Many publications exist in the Polish market, but most are characterised by a superficial theoretical approach in comparison with the literature in Western Europe [11].

While Czech universities mainly offer environmentally-oriented courses in biology and chemistry faculties or departments, environmentally-oriented courses are mainly found in technical faculties and departments at Polish universities.

Beyond this, we can see considerable weaknesses, especially if we look at core areas of operational environmental management such as environmentally-oriented production, procurement, marketing, logistics and at the international orientation which is only sparsely integrated in the programs.

Therefore the expectations for environmentally-oriented studies are high and only some universities have successfully integrated them into their programs or have started to implement them [9]. But we must state that environmental education has been developing dynamically in Poland and the Czech Republic. Every year, more programs and courses with an environmental orientation are introduced which we observed during our analysis.

Table 9 Strengths and weaknesses of environmental education in Poland and the Czech Republic

<i>Strengths</i>	<i>Weaknesses</i>
<i>Poland/ Czech Republic</i>	
The profile of education is mainly technically-oriented, but more often sustainable development is taught (mainly at universities of business administration and economics)	Early contacts to potential employers at the universities and institutions of higher education are hardly recognisable
<i>Poland</i>	
Relatively high numbers of environmentally-oriented specialisations, i.e. a wide ranging spectrum of education	Environmental management is only basically dealt with in teaching
A high number of teaching staff, mainly specialised in natural sciences	Environmental education is often very specifically directed within engineering, therefore environmental topics are dealt with in a very biased way
Good prospects for graduates in the labour market in environmental areas due to the recent political situation and the social-economic transformation	Relatively low interest of students (their priorities: marketing, business management, law, informatics, banking, psychology)
	A deepening of theoretical knowledge takes place rather than the application of theory in practical case studies
	Infrequent teaching of application-oriented knowledge and interdisciplinary perspectives
<i>Czech Republic</i>	
Integration of environmentally-oriented courses and specialisations in the study programs of almost all institutions of higher education	Only partial integration of environmental management into the study programs
Relatively high interest of students in compulsory and optional environmentally-oriented courses in economics and business administration due to area-specific environmental problems	Deficits in teaching operative environmental management (environmentally-oriented production, procurement, marketing, organisation)
	Low level of knowledge about environmental control
	Theoretical knowledge is complemented only to a lesser extent by practically oriented case studies and practical projects
	Lacking international cooperation
	Lack of financial means for establishing a specialised library

Source: International Graduate School Zittau

In general, we can state that the range of environmentally-oriented programs and courses, especially at universities of business administration and economics, can be further developed. Above all, an integration of environmental aspects into the compulsory courses of business administration makes sense in order to provide future graduates of business administration with insights into the numerous relationships between ecology and economy and the resulting developments in society. We would recommend further deepening of such aspects considering the increasing tendency to link ecological and economic issues.

In comparison to Western European models of education we state that in EU countries the cooperation between university institutions, firms and public institutions is better developed than in Poland and the Czech Republic [8]. For that reason, a relatively high need for cooperation, research activities and know-how-transfer between West and East exists.

4 Conclusions

Our objective in analysing environmental education at Polish and Czech institutions of higher education was to find out the extent to which environmental aspects are included in teaching programs. We then elaborated on the strengths and weaknesses and commonalities and differences in the intensity of the environmentally-oriented programs at these institutions. In our analysis we found that environmental education in Poland and the Czech Republic is to a high degree technically-oriented. But universities are characterised by dynamic developments in this area. Despite these developments, aspects related to business administration, such as selected environmental management instruments (environmental controls, environmental cost accounting) or operative environmental management (environmentally-friendly procurement, production and logistics) are not extensively represented. On the other hand, relatively greater emphasis is placed on the international orientation of environmental education in Polish and Czech universities due to changing economic, social-ecological and other framework conditions in the context of the EU-enlargement to include Central and Eastern Europe. In the context of the above-mentioned investigation about economic studies at German universities, we found 65 universities to be involved. At these universities 88 environmentally-oriented courses are taught which are offered in 104 different programs [4]. We concluded that due to the long-term development of environmental consciousness in Germany, a very differentiated landscape of environmental education has emerged, especially in economics and business administration. The programs offered range from courses about the relationship between economy and ecology, aspects of environmental management in the form of strategic and operative environmental management, environmental management instruments and systems, environmental policy and environmental law to related areas such as environmental psychology and ethics, and environmental technology. An international orientation towards aspects of ecologically-oriented economics is however missing.

On the basis of the strengths and weaknesses in environmental education at Polish, Czech and German universities, opportunities may arise to bundle the existing experiences and knowledge and to complement it by new components. For this reason, at the Chair of Business Administration and Accounting at the International Graduate School Zittau we developed a curriculum for environmentally-oriented management which is distinguished not only by its interdisciplinarity but also by its focus on Middle and Eastern Europe. The curriculum development was sponsored by a model project of the German Federal Foundation for the Environment (Deutschen Bundesstiftung Umwelt) (see [12] and more extensively: <<http://www.ihl-zittau.de/bwl/iium>>). The content of the studies was designed in such a way that problems from business administration and economics are linked with legal, technical and behavioural aspects. Normally, a German-Polish-Czech comparison is conducted. The elaboration of the

curriculum was supported by an international cooperation network which comprises seven universities from each country (Germany, Poland, Czech Republic), an Austrian university, and 17 firms and firm associations from Germany, Poland, and the Czech Republic. An objective of the project is to transfer the whole curriculum or modules to interested German, Polish and Czech universities. For that purpose, we have already selected one German and several Polish and Czech pilot universities. After the know-how transfer these universities will be the base for knowledge diffusion. Therefore, the project results contribute to the development of environmental knowledge, behaviour and the education of future leaders in politics, the economy and sciences.

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Appendix 1

Questionnaire

For obtaining specific information about the teaching at Polish and Czech universities:

- 1 Is environmental protection included in the study programme of any of the professorships at your universities?**
- 2 In which form is environmental protection considered in the study program of this chair?**
 - a) within the framework of the general studies
 - b) as specialisation
 - c) as own faculty/chair
 - d) as postgraduate studies
 - e) as distance learning courses
 - f) other
- 3 Who are the people responsible for environmentally-oriented studies?**
- 4 Which topics do you focus on in your environmentally-oriented programmes?**
 - a) Environmental law, environmental policy
 - b) Environmental management (environmental management systems - EMAS, ISO; environmental management instruments - Environmental audit, controlling, cost accounting, LCA ,environmental assessment)
 - c) Environmental technology (water, soil, air, energy, waste)
 - d) Practical experience
- 5 How do students find the environmentally-oriented studies?**
 - a) good because ...
 - b) bad, because ..

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