


Article

Creating Transdisciplinary Teaching Spaces. Cooperation of Universities and Non-University Partners to Design Higher Education for Regional Sustainable Transition

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Abstract: Teaching formats involving non-university partners are increasingly gaining importance to deliver key competencies needed in higher education for sustainable development. Such teaching formats may also create new transdisciplinary spaces that allow different actors to impact regional transition towards sustainable development. Against this background, this article focuses on how universities foster regional transition through teaching, particularly in collaboration with local non-university. Using the interdisciplinary certificate programs on sustainable development offered by the German Universities of Tübingen and Duisburg-Essen as case studies, we analyze the potentials and challenges of teaching programs on sustainable development for promoting regional transition. Leaning on the multi-level-perspective-approach, we have used qualitative interviews to shed light on the design of cooperation between the university and regional partners as well as the creation and integration of transdisciplinary learning spaces. This paper shows that the impact of such teaching formats on the regional transition consists primarily of awareness and network building. One of the most fundamental challenges faced is unequal power relations in terms of access to resources, financing, and doing the course planning. Simultaneously, co-design, mutual understanding, and collective decisions on roles and responsibilities and—especially—empathy and trust are crucial factors for successfully teaching cooperation towards regional sustainability.

Keywords: higher education for sustainable development; education for sustainable development; ESD certificates; regional transitions; transdisciplinary; multi-level perspective; critical institutionalism; transformative teaching; SDGs; SDG4; sustainable development; education



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1. Introduction

The United Nations' 17 sustainable development goals (SDGs) intended to be achieved worldwide by 2030, underline the importance of addressing rising inequality and unfolding consequences of climate change. Countries and institutions across the globe are called upon to pursue these goals. For the realization of the SDGs, transformative actions on the local and regional levels are crucial. One important feature of the SDGs is the enormous focus on education, especially Education for Sustainable Development (ESD) (SDG N°4.7). What is being done by the academia and higher education institutions (HEI) themselves to contribute to sustainable (regional) development? Building upon this question, this article focuses on “teaching” at HEI to examine the extent to which ESD has an impact on the surrounding region regarding sustainability.

Several HEI in Germany are committed to shaping the path to sustainability (cf. [1], HOCH-N, Netzwerk N). In 2018, the German Rectors' Conference (HRK) called for a

“culture of sustainability” at HEI [2]. The German Council for Global Change (WBGU) sees research and education as drivers of a “Great Transformation”: HEI could foster the knowledge-based societal transformation process into a low-carbon, sustainable society. [3] (p. 321). For this purpose, new alliances are needed between universities and society.

However, Schiller et al. [4] note that regarding the debate on the role of HEI to foster transitions towards sustainable development, the role of regions is hardly taken into account. They identify regions as an important arena of action for the co-creation of solutions to face global challenges [4] (p. 121). In this context, transdisciplinary approaches are crucial to integrate the expertise and visions of regional stakeholders. Nevertheless, in the debate on transdisciplinarity, the potential of teaching to create cooperation with relevant stakeholders remains underexplored [5,6]. In this article, we take these aspects and focus on the relation between transformative teaching, transfer, and transitions towards sustainable development on a regional scale. Our research question is, how can the cooperation between the university and non-academic partners pave ways for regional transitions towards sustainable development? Following this question, we have analyzed the cooperation’s design: What are favorable factors and challenges, what are potentials and difficulties regarding possible impacts at the regional level? Moreover, we explored how actors interact within that cooperation and how it affects the other levels outside of the cooperation. Contemporary articles seem to predominantly concentrate on the perspective of universities. In this study, we focus on the perception of both regional as well as academic actors.

We adopted the theoretical approach of Multi-Level-Perspective (MLP) to analyze the relations between regional stakeholders and HEI on different levels. The MLP offers useful analytical tools for understanding systemic changes on different scales while considering complex relationships between different actors.

We chose two certificate programs for Sustainable Development as case studies for this study because both include strong transdisciplinary teaching formats: University of Tübingen’s *Studium Oecologicum* and University of Duisburg-Essen’s *Certificate for Education for Sustainable Development*. Both programs are interdisciplinary certificate programs in which students of all faculties can participate and earn ECTS. Due to their standing as across-faculty teaching offerings, the certificate programs have a broader space of action to experiment with innovative teaching-learning-approaches and cooperation with non-academic stakeholders. Details about the certificate programs can be seen in Table 1. In both case studies, we focus on project seminars and thematic seminars held within the respective certificate programs that involved project partners from the local environment.

Table 1. Education for Sustainable Development (ESD) certificates at the Universities of Duisburg-Essen and Tübingen. Source: Own illustration.

Name	University	Founding Year	ETCS Required	Composition
<i>Certificate for ESD</i>	Essen-Duisburg	2016	At least 8 ETCS	1 basic, 1 project and, 1 thematic seminar or 1 basic and 2 thematic seminars
<i>Studium Oecologicum</i>	Tübingen	2009	At least 12 ETCS	At least 1 basic seminar and 2 thematic seminars

2. Conceptualization

In the following paragraphs, we present analytical tools to conceptualize the relationships between HEI and non-academic stakeholders: first, we outline the actual debate on the need for transformative and transdisciplinary teaching approaches and secondly, explain the transition-approach and MLP and adopt them to the two case studies.

2.1. The Need for Transformative and Transdisciplinary Teaching at HEI

Transformative education was introduced by the WBGU in 2011 as a complement to “transformative science”, an approach that sees science as a catalyst for transforma-

tions towards a sustainable, low-carbon society. Transformative teaching means at the very heart, participants “encounter a perspective that is at odds with the prevailing perspective” [7] (p. 76). Singer-Brodowski [8] differentiates between approaches that foster the transformation of the self and transformation in the sense of collective emancipatory processes. The former strengthens the reflexivity of learners to become conscious about their view on the world and to acquire competencies of critical thinking and acting. The second approach relates to collective learning processes of awareness-raising in which learners reflect on their relationship with the social environment and become active parts of global transformations (change agents). Transformative teaching implies therefore a didactic approach that is participative, inclusive, and opens up diverse perspectives (multi-perspective) [9]. The German HEI network on sustainability at universities HOCH-N has developed quality standards for Higher Education for Sustainable Development [10]. According to the HOCH-N guidelines, the methodology of transformative teaching processes implies a change in the perspective of roles so that teachers step out of the part of primarily “delivering knowledge” and become part of a collective learning process [10] (p. 39). Transformative teaching-learning-approaches need real-world-contexts in which students work on concrete challenges of sustainable development [10] (p. 40). In this context, the ESD 2030 roadmap highlights the significance of transformative learning environments and cooperation with community-based local leaders, non-governmental and private sector actors, working for sustainability “to engage the local community as a valuable setting for interdisciplinary, project-based learning and action for sustainability” [11] (p. 28). Building on that, this study integrates out-of-university learning spaces (physical spaces which are not part of the university but where learning takes place) as transformative learning environments and agents of cooperation with regional partners.

In the context of sustainable development, transdisciplinary approaches that include collaboration with non-academic stakeholders are perceived as crucial for HEI [12] (p. 336). Stakeholder engagement is seen as a “social learning process, where diverse stakeholders share a common forum, learn about each other’s values and create a shared vision.” [12] (p. 337). The WBGU highlights the importance of inter- and transdisciplinary understanding of knowledge, as well as participatory approaches based on the cooperation between science and society for a co-creation of knowledge [13]. Recently, many HEI refer to a “third mission” that denotes actions and functions that universities take to interact with society [4] (p. 146). However, Schiller et al. [4] (p. 121) state that in most cases the third mission is focused on the cooperation of HEI with business stakeholders, such as local firms. This reaffirms the model of the “entrepreneurial university” which underlines the focus on the economic impact of research [4]. On the other hand, the model of an “engaged university” sees HEI in the role of active “animateurs” who build up cooperation with local communities and search for solutions for societal challenges [14]. Schneidewind [15], who supports the concept of transformative science, goes even that far saying that the so-called “third-mission” should rather be the “first-mission”. In any case, Radinger-Peer and Pflitsch ascertain that HEI can be viewed as “drivers for innovation”, especially because of their “regional potential” to connect local nodes with international networks [5] (pp. 162, 164).

2.2. A Multi-Level-Perspective on ESD Certificates

When theorizing HEI and its contribution to sustainability, many researchers [1,3,8,16] refer to the “transition management” concept [17]. Loorbach defines transition as “multi-level, multiphase processes of structural changes in societal systems” and suggests transition management as an answer to the pressing questions of the 21st century for a sustainable development that can help to unravel the complex interaction patterns and lead to a non-linear change in seemingly stable regimes [18] (p. 8). To explore the relations between region and HEI in cooperation towards regional sustainable development, we adopted the Multi-Level-Perspective (MLP) by Geels [19,20] which is a central approach in transition science. It allows the analysis of the complexity, multi-dimensionality, and co-evolution of transformative processes [3] (p. 99).

Geels [20] and Grin et al. [17] differentiate three main levels of MLP that relate to each other:

- Level of landscape: The socio-technical landscape forms a broad exogenous environment that as such is beyond the direct influence of regime and niche actors [17] (p. 23). It includes material aspects of society, such as infrastructure, but also cultural norms and values, such as the principle of freedom of science in academia or the paradigm of economic growth in politics.
- Level of socio-technical regimes: institutional aspects and actor networks in a socio-technological system. The rules and cognitive routines of socio-technical regimes account for the stability and lock-in of the socio-technical system.
- Level of niches: It is assumed that radical innovations often emerge outside or on the fringe of existing regimes, where niches act as “incubation rooms”—in a protected area against mainstream market selections [17] (p. 22). It is the space for learning processes and experimenting with new alternatives for sustainable practices. Therefore, niches are the “seedbed” for systemic changes [19].

Niches and regimes are embedded in the context of the landscape. The MLP helps to explain why systems are stabilized in certain ways (so-called lock-ins) and to identify factors that can contribute to systemic changes.

MLP is theoretically underpinned by evolutionary economics and sociology of technology to understand processes in the socio-technical system and neo-institutional theories to examine the role of rules and norms as well as of the agency. In this article, we analyze how and why actors behave inside the niche and whether and how the institutional system allows an alteration of the regime. To do so, we have used the actor-centered institutionalism by Mayntz and Scharpf [21,22] and critical institutionalism coined by Cleaver [23–25]. We define institutions as formal and informal rules, norms and values and use actor-centered institutionalism especially to understand the actor’s orientation (motivational aspects, cognitive aspects, and orientation of interaction) and situation [21,22] (cf. Figure 1).

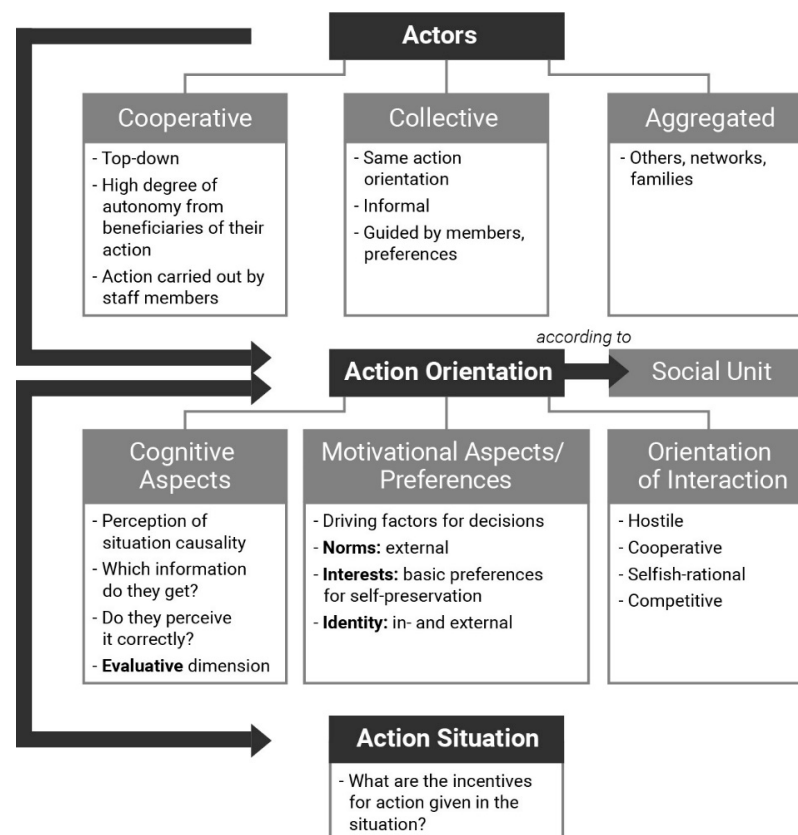


Figure 1. Actor mind map template. Source: Roose [26] (p. 32) based on [27].

The combination of actor-centered institutionalism with critical institutionalism helps to address questions of complexity, power, and justice. To avoid romanticizing local actors, movements, or organizations, their wider context e.g., the related regimes and interplay of the formal and informal institutions are considered. As Roose [26,28] shows, the presence of formal and informal institutions plays a significant role in the emergence of (social) innovation by building up trust and reciprocity. Cleaver [23] observes that often those formal and informal institutions are (re-)arranged according to their contexts and describes this as institutional bricolage.

Additionally, this theoretical approach helps to address the scaling-aversion dilemma that questions whether an “upscaling” might not change the innovation itself, rather than changing “the system” [29] (p. 145). This research is not about looking for ways to force niche practices into the broader regime but to understand and outline what the formal and informal institutions and processes of those niches are about, how they relate to sustainable regional development, and what potential lock-ins of the regime could be.

Schiller et al. [4] are among the few researchers who apply the MLP to the area of HEI. According to them, the higher education system can be assessed as a regime that is influenced by higher education policies on the level of landscapes. The area of teaching at universities can be identified as its own sub-regime. It encompasses different actors’ groups that offer courses with their own values (*Leitbilder*) and module plans (*Modulhandbücher*) and pursues certain routines. It is influenced by student’s expectations and higher education policies at the federal/national level. At the level of landscape, he identifies global visions, such as the SDGs or institutional infrastructure like the system of financing HEI. In the niches, he identifies rooms to experiment with sustainable practices, such as engaged groups or individual scientists. In this article, we follow the assumptions of Schiller et al. [4] and state that these niche open spaces to experiment with alternative or transdisciplinary teaching formats, enable the application of innovative methodologies and the co-creation of knowledge with regional stakeholders. We argue that the selected case studies—the certificate programs on Sustainable Development at the University in Tübingen and Essen—can be seen as such niches for transdisciplinary teaching formats. Their potential lies in the fact that they do not have to fulfill curricular module plans and therefore have much more space for experimenting with new teaching methodologies. We aim to find out how far certification programs are building a niche and how the potential interrelation with the level of regime and landscape may look like. Applying the MLP approach to our case studies, we see the following structure of landscapes, regimes, and niches (see Table 2).

Table 2. Multi-Level-Perspective (MLP) approach applied on ESD certificates. Source: Own illustration.

MLP	Actors	
	HEI/Teachers	Regional Actors/Partners
Landscapes	values and visions (e.g., freedom of science, SDGs), broader institutional infrastructure: financing system	various (values, visions, etc. depending on the actor’s context)
Regimes	HE policies, curricula, teaching standards, module manuals	various (e.g., regional and national policy, culture, industry, technology depending on actor’s context)
Niches	cooperation via certificate	

While the actor groups “HEI” and “regional actors” belong to different landscapes and regimes, we identify the “cooperation via certificates” as common open space/niches for creative cooperation towards sustainable development.

At the University of Duisburg-Essen, the certificate is situated at the “*Studium liberale* of the Institute of Optional Studies in which students can acquire credit points for courses on

key competencies (*Schlüsselqualifikationen*). At the University of Tübingen, this area is called *Studium Professionale*. The certificate *Studium Oecologicum* is coordinated by the Competence Center for Sustainable Development in cooperation with the *Studium Professionale*. The seminars offered by both certificate programs do not fall under the rules of a certain module manual of any faculty. Hence, they could be classified as a protected institutional space constructed by advocates in academia [30].

Arguing that two certificate programs are "niches" for a transformative learning process, we take them as case studies to explore the potential of cooperation between universities and non-academic partners for regional transitions.

3. Methodology

This study places significant importance on the actor's experiences and uses an inductive, qualitative method of semi-structured interviews. In total, 13 interviews were held with 13 different partners under the conditions of informed consent spanning between 20 and 60 min. To choose the interview partners, we first screened the project seminars of the respective ESD certificates of the last two years and then contacted the teachers and/or a project partner of recent seminars (earliest 2018). Essential criteria for selection were whether students were actively involved in the teaching dynamics and whether the course was held in cooperation with a non-university partner. Table 3 shows the number of qualitative interviews, interview partners, and their roles in the teaching project and localization. To highlight their connection to sustainable development, we also categorized them according to the SDGs.

Table 3. Interview partner and seminar details. Source: Own illustration.

No.	Role of Interview Partner	Organization/Business	Seminar	City	Relation to SDGs
1	Teacher and project partner	Project for a sustainable neighborhood	Sustainability reporting for local organizations and businesses (2019)	Essen	12
2	Project partner	Free-of-Plastic shop	Sustainability reporting for local organizations and businesses (2019)	Essen	12
3	Project partner	Networking and conference business	Sustainability reporting for local organizations and businesses (2019)	Essen	12, 11, 17
4	Teacher and project partner	Urban agriculture project	More than Honey (2018)	Essen	15
5	Teacher	Independent teacher/NABU	More than Honey (2018) Audiowalk (2017/18)	Essen	15 7
6	ESD Certificate Coordinator	University of Duisburg-Essen	Not applicable	Essen	Not applicable
7	Certificate project coordination, teacher	University of Tübingen	Towards a local food policy council (2020) and others	Tübingen	2, 11
8	Project partner	Initiative for a local food policy council	Towards a local food policy council (2020)	Tübingen	2, 11
9	Project partner and teacher	Community-supported agriculture project (coordinator)	Towards a local food policy council (2020), Community-supported agriculture (2016–2019)	Tübingen	2, 11, 12
10	Project partner and teacher	Cacao cooperative and fairtrade activist	Fair chocolate (2019, 2020)	Tübingen	12, 17
11	Project partner and teacher	Journalist and fairtrade activist	Fair chocolate (2019)	Tübingen	12, 17
12	Project partner and teacher	Non-governmental organization (Global Learning)	Utopies and transformation/Global Learning in practice (2020)	Tübingen	4,12
13	Project partner and teacher	Solidary housing cooperative	Socio-ecological transformation in the city (2020)	Tübingen	11, 12

The semi-structured questionnaire is deduced from our main research question to discover the impact of transdisciplinary teaching cooperation on regional sustainable

development (see Appendix A). We oriented the questions according to the central analytical concepts (e.g., sustainable regional development, MLP approach) and included questions to better understand the origin and dynamics of teaching cooperation (e.g., genesis, methodologies, respective roles, etc.). The questionnaire has been adapted to the interview partners' context as needed. Interviews were analyzed leaning on the qualitative content analysis [31] using the data analysis program MAXQDA. Codes were built in-vivo and inductively according to the spoken words and then categorized inductively according to the topics mentioned or deductively according to the questions asked. Further categories were built for the motivational aspects and the interaction orientation according to the actor-centered institutionalism. The methodology applied allowed the comparison of experiences of university staff members, contracted teachers, and regional partners in Tübingen and Essen, to assess the design and impact of transdisciplinary teaching projects on regional transitions.

4. Results

The following paragraphs show the results of the interview analysis categorized by our leading questions.

4.1. Genesis and Arrangement of Teaching Cooperation

We examined eight different teaching projects involving different regional partners. As the first step, we analyzed how these teaching cooperations were established, who took the initiative, and which role was taken by the regional partners.

4.1.1. Initiative for Teaching Cooperation and Role of Regional Partner

In six out of the eight cases, the regional partner was invited by university teachers. In the other two cases, the regional partner contacted the university to offer a course or do it together. In six of eight courses, a cooperative teaching format ("tandem-teaching") was carried out in which teachers with scientific and practical backgrounds taught together. In three courses, the praxis partner itself taught the course. In such cases, the teachers shared the double role of representing a local initiative and disseminating content. The invitation of regional partners was mostly based on existing personal contacts (13 codes) or involvement in the same networks, for example, transition-town (2 codes). In most courses, the invited regional partners further contacted other local initiatives. This showed that all courses weaved a broader network (beyond the mere regional partner) and that the courses themselves had a snowball-effect of creating and strengthening civil society networks.

The regional partners were involved in the course design in different ways. Their roles can be categorized in the following way:

- Teacher (Interview N°12 + 13)
- Co-teacher together with university member (Interview N°1–5, 9–11)
- Host for student excursions (Interview N°9 + 13)
- Expert for student's questions and discussion (Interview N°8)

The roles of the regional partners had implications on the design of course methodology and contents, and whether this was done horizontally or asymmetrically.

4.1.2. Decisions on Course Design

The course design consisted of decisions on content, methodology, and integration of local initiatives or excursion sites. One major challenge indicated by the interviewed in designing the course was ensuring proportionate representation of both sides so that the visions of both (university and regional partner) are equally considered. In some courses, the only consultation with the regional partner was possible (1 code). In other courses, the interviewed partners outlined a cooperative way to plan the course (4 codes): there were planning meetings in which the partners shared expectations and developed the structure of the course together, and divided tasks.

On the one hand, for the regional partners performing as teachers, one challenge found was adapting the course design to the requirements of the university, for example regarding the time structure (1 code): courses in the “*Erweiterungsbereich*” (key competencies) usually are held in one (or maximum two) weekend(s). Another challenge was the integration of evidence of academic achievements (*Leistungsnachweise*), sometimes even with grades (3 codes) in the course structure. For example, this required providing enough time for student’s presentations or other forms of contributions. On the other hand, these courses also provided the regional partners with opportunities to combine their work related to sustainability in the region with the requirements for students (e.g., doing a stakeholder survey on local food policy), which offered a win-win situation for all actors involved. Moreover, some courses took recent events (2 codes) as points of departure to design the course program, for example, the release of the movie “more than honey”; while others took urban transformation strategies as central topics for their course design (2 codes).

4.2. Methodological Diversity and Out-of-University Learning Spaces

Transdisciplinary courses feature a broad variety of methods, involving out-of-university learning spaces. The methods and out-of-university learning spaces used in the courses analyzed in this paper are as follows (see Table 4):

Table 4. Methods and out-of-university learning spaces. Source: Own illustration.

Method (Involving Regional Partners)	Integration of Out-of-University Learning Space	No. of Cases
Expert talk	Fairtrade-store, local initiatives	4
Hands-on: practical work in situ with regional partner	Urban gardening project, community-supported agriculture field, the editorial department of the local newspaper	4
Excursions	Fairtrade store, local initiatives, abandoned coal mine converted into a biodiversity hotspot	3
Interviews	Visit local initiatives and start-ups, such as plastic-free shops	2
Audio-walk/city walk	Visit community housing projects	2
Presentations	Not applicable	2
Label-rally (topic Fairtrade)	Fairtrade-store	1
Exposition visit	Exposition about cocoa trade in the municipal library	1
Creation of fact sheets	Not applicable	1
Creation of a poster exhibition	Not applicable	1
Creation of a concept for neighborhood development	Community housing project	1
Stakeholder survey	online	1
Public survey	International chocolate festival	1
Collective mapping	Not applicable	1
Games	Not applicable	1

Most of these methods implied working in small groups and collective learning processes. It was observed that the requirements for the students (*Leistungsnachweis*) are often innovative and involved creative co-working-formats, such as designing poster exhibitions. While this required more time and engagement from the students, it gave

them an insider's view into the real-life-work and needs of the regional partners. It opened spaces of direct interaction with them, in which the regional partners advise students or mentor their practical work, or they can even receive feedback from the students about their work. But, for the teachers and regional partners, such methods meant spending more time on coordination and enhanced communication with different actors. Most of the methods listed here are combined with out-of-classroom activities. Therefore, as a second step, we explored the significance of taking students out of university space.

The integration of out-of-university learning spaces in the teaching methodology was positively received by the students (4 codes). They evaluated excursions and interactions with regional stakeholders especially as "enrichment" of their studies and professional perspectives (Interview N°6). However, the organization of such activities implied additional administrative and organizational difficulties to resolve: insurance of the participants during the trip or financial implications (ex. entrance fees can be a barrier for students). For the university itself, the organization of excursions implied further costs (renting transport, higher payment for teachers). Some authorities also questioned the didactic advantages and higher workload of excursions.

From the perspective of the teachers and regional partners, the potentialities of such activities can be summarized in the following way:

- The real world-oriented learning process (2 codes): The direct visit and insider's-views into the practical work of the regional partner, connect to real-life and daily experiences of students (Interview N°7).
- Horizontal discussion culture (2 codes): The change of the setting creates a more open and confidential dialogue space. "The concrete example opens other questions. It's a more accessible discussion culture, a more informal setting where you stand near each other and discuss together about a certain topic or place." (Interview N°13).
- Empowerment of regional partners (4 codes): The visit of a student's group contributes to the visibility and acknowledgment of the work of regional partners. This was observed especially in the case of farmers of community-supported agriculture groups: "It's a kind of acknowledgment that they (farmers) themselves can talk about their experiences and work, which is heard and reflected by the students, and transmitted. There's nothing worse in the area of agriculture than having to work on your own and produce anonymous vegetables for an anonymous market." (Interview N°9). On an epistemic dimension, the dialogue with students contributes to making the practical, experience-based knowledge of the regional partners visible. This was also seen in the case of migrants engaged in a Fairtrade initiative (Interview N°10).
- New perspectives for the regional partner (3 codes): The learning process between students and regional partners can lead to mutual learning. The regional partners gain new perspectives and inspirations for their work (Interview N°11). Some consider it fruitful to take time during seminars to discuss topics more profoundly, for example on sustainable alimentation (Interview N°8). Additionally, such visits can facilitate a direct connection between the results of the seminar and the work of regional partners (Interview N°5).
- Possibilities for transformative learning processes (7 codes): In most cases, the out-of-university learning spaces represent living examples of sustainable practices and alternative world visions. In a hands-on-learning process, students can discover how different actors put their visions into practice as well as the challenges they face. The teachers have to do this transfer—to connect real-life experiences with conceptual perspectives, for example with the issue of strategies for socio-ecological transformation. This potential was highlighted for example by the city walks for projects on alternative housing or economies (Interview N°13). Such visits and direct interaction with this kind of 'niches' of urban transformations can contribute to a change in students' perspectives on their own environment and create motivation for a long-term engagement.

4.3. Favorable Factors and Challenges for Transdisciplinary Teaching Formats

In our analysis, we discovered several favorable factors and challenges for successful transdisciplinary teaching cooperation, which we discuss in the following sections according to different functional levels. An overview is shown in Table 5.

4.3.1. Classroom Level

A mixture of theory and practical engagement: Our analysis underlines that a well-balanced mixture of scientific knowledge and practical work is crucial for fruitful cooperation (10 codes by 6 people). With specific formats such as tandem-teaching with university teachers and a local initiative, this is put into practice. The format chosen should be adapted to the local context and needs of the stakeholders. 6 codes highlight the importance of integrating students in the practical work of the regional partners. Some even see a transformative potential in combining scientific debates and real-world-experiences (Interview N°13). However, a major prerequisite in combining theory and practice is having a common language for all stakeholders (1 code).

Table 5. Favorable and challenging factors for transdisciplinary teaching cooperation. Source: Own illustration.

Level of Interaction	Favorable/Challenging Factor	No. of Codes by Person
Classroom level	Mixture of theory and practical engagement	10 codes by 6 people
	Interdisciplinary and transdisciplinary setting	5 codes by 3 people
	Different backgrounds and motivations of students	3 codes by 3 people
Level of cooperation of regional partners and teachers	Co-design by the university and regional partner	15 codes by 6 people
	Empathy and mutual confidence	14 codes by 7 people
	Adaption of course design to university requirements	8 codes by 3 people
	Feedback-loop and long-term continuity of teaching cooperation	10 codes by 5 people
Level of certificate coordination	Criteria for the selection of cooperation partners	6 codes by 3 people
	Difficulties to find regional partners and teachers with similar interests	21 codes by 9 people
	Difficulties to find students	6 codes by 1 person
	Bureaucratic burdens for the quality development of the course program	4 codes by 3 people
Level of university structures	Limited funding and working conditions of university and freelance teachers	4 codes by 4 people
	Lack of integrative approaches of sustainable development within HEI	4 codes by 2 people
	Missing science-society-contact	2 codes by 1 person

Inter- and transdisciplinary setting: the courses offered in the ESD certificate programs have the challenge, as well as the potential to open up interdisciplinary learning space for students with different disciplinary backgrounds. Some teachers (2 codes) highlighted the challenge to adapt the contents and excursion design in a way that all students can understand the topics and participate without previous knowledge. Others (2 codes) consider horizontal, collaborative learning processes in which hierarchies between knowledge levels are of less importance as promising (Interview N°13). Moreover, given the transdisciplinary setting of teaching projects, another challenge is to not only focus on one example of sustainability and highlight the work of the regional partner but also to present a rich diversity of initiatives and different perspectives to the students (Interview N°1).

Different backgrounds and motivations of students: Another challenge is to integrate students who are merely interested in gaining ECTS fast (1 code) in the course dynamics.

Even more challenging is the requirement to integrate students with different backgrounds and previous knowledge in the area of sustainable development (2 codes): some students can be already active in different initiatives while others are exposed to alternative world views and projects for the first time. For the teachers, the challenge is to include students with different backgrounds without demanding too much or being too basic from one group or the other.

4.3.2. Level of Cooperation of Regional Partners and Teachers

Co-Design: Our analysis shows that the co-design by the university, teachers, and regional partners is “key for the success of the course” (Interview N°7). This requires good communication and agreements in advance about time, resources, and roles. The understanding of the respective roles especially seems important to bring different competencies, from both science and practice, together in the course design. This implies considering differences in capacities of time and resources, as some regional partners are working voluntarily, others can include the course in their regular work, whereas university members usually do the courses as part of their teaching load. The ideal should be that decisions on course design are taken on an equal footing: “*auf Augenhöhe*” (Interview N°9). Our study shows that it is crucial to have open spaces for exchange and reflection in which both sides can speak openly about aspects of the course cooperation (Interview N°11) to get a better understanding of each other’s expectations (Interview N°12).

Empathy and mutual confidence: This has been mentioned in 14 codes by 7 people. 6 codes by 6 different people highlight the importance of a good, confidential relationship between the university and the regional partner. Existing personal contacts and networks with groups fitting the topic are crucial since the experience with “forced partnerships” or delegated cooperation turned out to be not successful (Interview N°7). A confidential relationship needs openness on both sides: for example, the openness of the university towards alternative dissemination methods of regional partners that are otherwise not very common at university, such as those of Global Learning (Interview N°12). Our analysis shows that confidential relationships often stem from the personal engagements of teachers, sometimes they are active in local initiatives (e.g., local food policy council) and bring in their topics into academic space (3 codes). Personal engagement contributes to teachers being perceived as empathic and authentic by the regional partner. However, it often results in “double roles” for such teachers who are both part of the university as well as local initiatives. In any case, the interviews highlight the crucial role of teachers as they are empathic to the needs of regional partners and make the linkages between university and stakeholders (Interview N°1).

Adaptation of course design to the requirements of the university: A major challenge viewed by several regional partners is adapting to the course planning dynamics of the university, and defining student’s contributions and its evaluation. Transdisciplinary courses often implement alternative evaluation methods, however practical contributions such as interviews, stakeholder surveys, etc. conducted by the students are found to be even more difficult to evaluate. Many teachers felt that integrating student’s presentations in a one-weekend-seminar while making it uniformly participatory, and at the same time having time for interactive didactic elements and discussions to foster horizontal learning processes was challenging.

Feedback-loop and long-term continuity: Interviews show that one major challenge is to document the results and bring them back into the work of regional partners. This was often due to restrictions on time or financial resources from the regional partner (e.g., the publishing of information sheets) or the university. In other examples, from the beginning of the course, teachers searched the contact with local media to have a chance to publish the results (e.g., public survey at the chocolate festival). In all cases, the critical process of the transmission of results back into the region and further continuity of the cooperation between the university and regional partner is one of the major challenges which is crucial for possible impacts on a regional scale. As the cooperation often goes back

to the initiative of an engaged individual, they are highly dependent on such individuals for future engagement.

4.3.3. Level of Certificate Coordination

Criteria of selection: From the perspective of certificate coordination, criteria for selection (with whom not to cooperate) are usually implicitly present but rarely transparent or reflected. Following are the key criteria mentioned in the interviews:

- Partners without intrinsic (or acceptable extrinsic) motivation
- Partners only interested in good public relations
- Partners with unacceptable financial claims (in relation to budget and usual remuneration of the university)
- Partners not willing to critically reflect on their own institutional practices

The intrinsic motivation of the regional partner as a crucial criterion for cooperation (Interview N°7) is supported by the reported importance of personal networks as a point of departure for transdisciplinary teaching cooperation. Some even prefer to cooperate with non-profit organizations to minimize possible vested marketing interests (Interview N°6) which could undermine the credibility of the whole certificate program.

Another factor of success in teaching cooperation is the spatial proximity between the university and the regional partner. This helps gain a mutual understanding of the potentials and necessities of a given context or neighborhood (Interview N°1).

Difficulties finding regional partners and teachers with similar interests: One key challenge is to find appropriate regional partners for teaching projects due to the following reasons:

- High amount of time needed for teaching projects (especially in the case of small start-ups or voluntary local initiatives) (9 codes by 6 people)
- Diverging expectations (5 codes by 4 people): some local initiatives have high expectations for the student's contributions which are often not compatible with the usual amount of time and requirements of the course
- Fear of too much transparency/negative publicity (3 codes by 3 people)
- Difficulties finding initiatives for practical activities (e.g., interviews (2 codes)) or integrating students in practical activities (e.g., agricultural work (1 code)).

These difficulties result in course projects often being done with the same partner (1 code). However, established certificate programs reported lesser problems in finding interested regional partners and teachers.

Difficulties to find students: As the certificate programs are localized in the area of '*Erweiterungsbereich*' (key competencies), students usually decide voluntarily to take a course. This can result in low registration for such courses. The course description is seen as very crucial, especially for the transdisciplinary courses, which appear to imply higher workloads than usual courses due to practical activities. On the other hand, the students who participate are motivated and the rate of course cancellations is very low (Interview N°8).

Bureaucratic burdens: The coordination of certificate programs faces several bureaucratic burdens that impede the integration of more practice-oriented courses, such as insurance issues. Another difficulty reported at both universities is the lack of access to course evaluations for certificate coordination. This is due to data safety reasons but this makes it much more difficult to control the quality of the whole program and decide which courses to select for the program.

4.3.4. University Structures

Limited funding and capacities: In both case studies, a certain imbalance between fulfilling the—often time-intensive—requirements of the university and the existing working conditions for teachers was mentioned. In particular, the transdisciplinary formats require more time than usual courses, especially for coordinating the practical activities. However, three interviewees mentioned limitations in the funding available for free-lance teachers,

as well as limited resources (funding for paid work) for university teachers which can limit the realization of transdisciplinary teaching projects. Practical activities and excursions require more financial resources (1 code). While students evaluate practical activities and excursions very positively (see Section 4.2), the extra efforts in terms of time and finance are usually not valued at the structural level.

Lack of integrative approaches to sustainable development within HEI: There are multiple actors disjointly engaged in activities for sustainability at university, such as student groups, operations, etc., who are often not cooperating. However, the interviews also showed efforts to make connections between these actors, e.g., in courses offered by the energy management of the university in Tübingen or the certificate in Essen which is managed by two different institutes. Another major challenge is to integrate perspectives of sustainable development inherently into the university curricula. Currently, the analyzed courses have the status of a voluntary offer (as being part of “*Erweiterungsbereich*”). This makes it difficult to find more students to participate in or to cooperate with faculties to integrate other perspectives on sustainable development in their disciplinary teaching (module manuals).

Missing science-society-contact: regional partners reported having problems finding the right contact person when they want to cooperate with universities and proposed networking to promote the integrated science-society-interface in a more integrated way.

4.4. Understandings of “Sustainable Regional Development” and Its Barriers

To understand what impact teaching/praxis seminars could have on regional sustainable development, it is important to understand the action situation and cognitive aspects of the interview partners. Therefore, we asked about their understanding of the concept and its barriers. The answers can be categorized into three overlapping groups.

- Process-oriented understandings (mentioned 18 times by 10 people) of sustainability and sustainable regional development focus rather on the design process of sustainable development than on the outcome e.g., interview partners value participatory processes that integrate different institutions and communities. Some mention approaches critical towards neo-imperialistic global structures, whereas others refer to normative perspectives, such as the concept of intergenerational justice.
- Practical/outcome-oriented understandings (mentioned 11 times by 6 people) focus on practical issues that need to be solved or implemented (such as sustainable mobility, waste management, sustainable value chain, fair trade, and supporting sustainable businesses).
- Concept-oriented understandings (mentioned 3 times by 3 people) were shown by two interview partners who referred to the SDGs or the “triple-bottom-line” model.

The barriers to sustainable regional development seen by the interview partners can be divided into a political level (mentioned by 8 people) and a societal or individual level (mentioned by 7 people). The first level refers to barriers like diverging political goals, party-political interests, and positions (e.g., conventional vs. ecological agriculture), missing over-communal cooperation, and administrative issues such as highly bureaucratic decision-making structures. Further, they criticize short-term financial support and limited resources for voluntary engagement. The second level refers to individual barriers in our society such as missing interest and awareness or the feeling of powerlessness. Additionally, vested economic interests of profit-making are mentioned as barriers.

4.5. What Is the Impact of Teaching on “Sustainable Regional Development”?

This was a central question of this research and was included in our questionnaire. Drawing from the answers, we found various indirect and a few direct impacts (see Table 6). Direct impacts are the tangible changes in the region. For example, in Tübingen one project seminar accompanied the creation of a local food policy council; as an outcome, a new organization was founded that now acts as a platform to connect various sustainable food initiatives in the region (7 codes by 5 people).

Table 6. Impacts of teaching on sustainable regional development.

Direct Impacts	7 Codes by 5 People
Introduction of cup deposit system	1 code by 1 person
Audiotour about renewable energy	1 code by 1 person
Media debate on Re-labeling of fairtrade products	2 codes by 2 people
Foundation of food policy council	3 codes by 3 people
Indirect Impacts	70 Codes by 7 People
Sustainability awareness/information rising	58 codes by all
towards students	26 codes by all
towards project partners	16 codes by 7 people
towards society	14 codes by 8 people
towards local politics	2 codes by 1 person
Strengthening of regional networks	12 codes by 7 people

Further, it should be mentioned that some interview partners doubt the existence of the direct impact of the project seminars on regional development. They are skeptical that no direct decisions are being made or projects initiated because of project seminars. However, it can be stated that various interview partners underline the potential of transdisciplinary seminars to create and strengthen networks between different initiatives, especially when it includes visits or excursions to various initiatives.

The indirect impacts mentioned by the interview partners can be divided into the following categories:

4.5.1. Sustainability Awareness/Information Rising

The strongest indirect impact of the teaching projects on regional development seems to be awareness rising for topics of sustainability which can be summarized in four directions:

First, towards the students: One of the most mentioned topics is the awareness building of the students themselves who then function as multipliers for sustainability. Interview partners report that after the course students started to rethink their behavior or got engaged with the project partners or the discussed topics after the course ended.

Second, towards the project partners: The interview partners reported that their projects or businesses profited from the external perspectives of the students and teachers. It helped them to get updated on the scientific discourse and allowed them to reflect on their own projects' structures and values for which usually they would not find the time. In some teaching projects, the seminar itself directly took up the partner's current needs and questions and therefore contributed to their work.

Third, towards society: According to the interview partners, the student engagement described above has been helpful for the project partners to make their work visible in the region as those project seminars often support scientific communication and strengthen the awareness of sustainability in the society on a regional level e.g., the course on fair chocolate in which students did a public survey at the international chocolate festival in Tübingen raised awareness. Through cooperation with local media, the results were published which led to a discussion of reorganizing the Fairtrade labeling of chocolate products at this event.

Fourth, towards local politics: Various interview partners reported that through their cooperation they can highlight or raise certain discussions in local politics. For example, the report produced by the group "More than Honey" was handed over to the environmental officer of the municipality.

4.5.2. Strengthening of Regional Networks

Interview partners reported that their networks got strengthened through the seminars. They strongly referred to the network between regional partners and HEI, but also mentioned connections to the municipalities and other actor groups of the society.

5. Discussion

The following discussion highlights the issue of ESD certificates as a niche and related processes as a key area of concern. Further, connections to the other levels of the MLP being regime and landscape are examined as well. In both cases, we shed light on power, relationships, and complexity.

5.1. *What Happens Inside the Niche of ESD Certificates?*

In this article, we assumed that the ESD certificates can be defined as a niche. Our interview analysis supports this assumption as well. First, it showed that the certificate programs offer a protected space where unconventional methods and innovative teaching-learning-approaches can be tested. Teachers go beyond the usual role of deliverer of knowledge and interact with students and regional initiatives in participative teaching projects. Our study showed that the integration of out-of-university learning spaces in the teaching methodology, in particular, creates transformative teaching environments (see above, [11]) in which students gain new perspectives by collaborating with local partners on concrete sustainable problems (cf. Section 4.2). This niche is insofar an open, but protected space as it is outside of the usual rules of the faculty's module plans. However, this flexibility is restricted to a certain limit as it is integrated into the university regime: Formal rules (for evaluation, length, etc.) set the base for the teaching activities, and help teachers to structure the courses and legitimate its existence inside the university system. However, the structures of the HEI regime also create bureaucratic burdens (cf. Section 4.3) that may hinder integrating transformative learning spaces. Unstable working conditions of teachers (free-lance contracts, no payment for course preparation, etc.) and limited resources for long-term teaching positions restrict these open spaces and therefore the possibilities to develop transformative teaching-learning-approaches.

Hence, the niche of ESD certificate opens space for creative, transformative approaches. It is embedded into the HEI regime structures that simultaneously protect and limit space for creative teaching. More resources and recognition for innovative teaching endeavors would be necessary to maintain and expand these niches.

Further, we observed that the agency inside that niche is highly influenced by the actor's motivational aspects (cf. actor-centered institutionalism). The certificate coordination sees it as a crucial criterion for transdisciplinary cooperation that teachers and regional partners have an intrinsic motivation towards sustainable perspectives. Most interview partners—be it teacher or regional partner—in this context show the motivation as change agents towards sustainable development in their regions (and by that globally e.g., sustainable, and fair consumption). Often, they fulfill several roles at once, i.e., being a teacher, activist, NGO member, etc. This motivation is reflected in the problem-oriented choice of seminar topics as those often focus on current challenges in their region (e.g., bee mortality, community housing) or field of work (e.g., sustainability reporting, fair trade). Further, motivation seems to heavily influence teaching design. Often, we found a mixture of theory and practical engagement in the course (cf. Section 4.3) that is developed via a combination and negotiations of formal and informal rules: teachers and regional partners bring in their competencies of academic expertise and practical experience that they have acquired due to personal engagement in sustainable initiatives or connection with local initiatives. In that sense, new knowledge and competencies are created through the encounter of different perspectives. The interdisciplinary and transdisciplinary settings of the courses help to ground theoretical content into different contexts and find and reflect on solutions to sustainability challenges. The innovation in those niches does not lie in the creation of completely new institutions but the putting together and re-creating of suitable institutions that together form something new in a sense of institutional bricolage (cf. [23]).

Hence, the claim of transformative teaching is recognizable in the teaching design, which is a process- and problem-oriented and goes beyond mere knowledge transfer. It is motivated by the aim to cause transformation processes on different levels. First, it provokes an impact on the students, teachers, and regional partners who through the course

are broadening their knowledge and reflecting upon their own structures and actions. These mutual learning effects can be described as nurturing agencies inside the niche of “certificates”, meaning the actors inside the niche improve and develop within a shielded space (see above [30]). Second, the interview analysis indicates direct and indirect impacts on the region such as awareness-raising, strengthening of networks, or even solutions to the problem stated in the course (cf. Section 4.5). Third, our analysis shows that trans-disciplinary teaching design can even have empowering effects for the regional partners. As our interviews indicate, particularly for lesser privileged stakeholders such as farmers or migrants, the fact of receiving visits by a student group and the opportunity to share their perspectives and experiences in their own voice, gives them visibility and recognition. As highlighted in decolonial studies on higher education, such encounters can contribute to a dialogue of knowledge that emphasizes the exchange of different perspectives from diverse contexts (universal, academic vs. local, practical-oriented knowledge) in a horizontal way [32]. The empowerment potential lies in the visibility of knowledge forms that usually are not acknowledged within the HEIs regime. This can lead to transformations on a normative level questioning established models and theories and open space for pluriepistemic perspectives within the teaching regime.

Our study showed that for the actors involved co-design of course-planning being on an equal footing as well as a mutual understanding of the respective roles and responsibilities are important. Those teaching formats and the interplay of formal and informal institutions require trust and long-term personal networks. This trust goes vice-versa between the university and regional partners e.g., the university needs to make sure that the regional partner does not misuse the course for commercial reasons and the regional partners rely on the cooperation with HEI teaching format to present their motivations for sustainable development. Regional partners and teachers often put time and effort into the project that flows beyond usual contracts. It is questionable if those teaching formats would even be possible without the extra engagement of the actors involved. The interview analysis showed that it is, therefore, crucial to understand the complex situation of the individual actors and their context. Actors must rely on each other in those teaching formats to shape the course-design in a cooperative way in which both sides bring in their expectations and experiences on the topic.

However, this relationship is marked by unequal power relations as regional partners depend on the HEI actors in terms of access to the teaching projects, formal organization, payment, and approval of the course contents. To deal with those unbalanced power relations between HEI and stakeholders, communication and common decision-making are the key (see Section 4.3). This helps to reinforce the trust and existing networks. In many cases, this trust is strengthened by the fact that HEI teachers are personally engaged in initiatives. Regional partners often obtain a double role of being teachers and sustainable activists. These double roles sometimes lead to ambitious—and time-intensive- course planning with idealistic visions but also have the potential to foster regional transitions with more impact. This intensifies existing networks between science and society, between HEI and regional stakeholders. In that sense, the certificates open transformative spaces for sustainable regional development even beyond the niche itself.

5.2. What Are the Connections to the Other Levels?

The MLP approach helps to analyze the potential for transitions at different levels (niche—regime—landscape). In this article, we define the HEI policies and the policy contexts of the regional partners as sub-regimes in which the certificate forms a niche for transformative teaching projects. The question is in which ways these transformative endeavors may have spreading effects on other levels or other sub-regimes. Regarding this question, we focused on the impact of teaching formats on a regional scale and their interconnections with HEI structures.

Smith und Raven [30] outline two ways of strengthening a niche inside a regime: “empowering to fit and conform” and “empowering to stretch and transform” (pp. 10–13).

Regarding the sub-regime of HE policies, it may seem like ESD certificates have been empowered to fit and conform because they are already institutionalized into the regime and identified as a protected space (cf. Section 5.1). However, we argue that this space is threatened. Although the investigated HEI officially aims to foster sustainability, their ESD certificates are in the need to defend their position, e.g., regarding financing. Hence, ESD certificates are claiming a special space in the regime and thereby stretching the system. Further, as the ESD certificates are open to students from all disciplines, this potentially stretches the curriculum of all faculties. Nevertheless, it is important to understand the existing formal and informal institutional structures of the niche. As mentioned before, the niche is marked by trustful networks between different actors. Empowerment in the sense of upscaling would need to recognize those existing informal and formal institutions and be aware of the scaling-aversion-dilemma (see above, [30]) to maintain its transformative and transdisciplinary purpose.

Looking at the regional partners, we can see that most of their activities are motivated by the aim of a “stretch and transform” empowerment [30], (pp. 12–13). However, the impact of the teaching project on the respective regimes is seldom direct. Therefore, the degree to which the niche of ESD certificates may influence the regime regional scale cannot be determined statistically. However, through our research, we can detect potential impacts. The analysis shows that impacts are primarily observed in awareness-raising, creating and strengthening networks of transformative stakeholders, and the capacity-building of students. Actors identify students as an important target group for the transition process and regional change because they are future decision-makers in media, politics, economy, and academia and will influence the directions of sustainable pathways. In that sense, the transformative teaching endeavors have multiplication-effects, also on a regional scale that cannot be measured quantitatively in a short-term study.

Further, the findings of creating and strengthening networks presented in Section 4.4 should not be underestimated. In some cases, long-term networks could be established, for example, the creation of a local food policy council as a new stakeholder in the region. In other cases, different projects were visited and interconnected via city walks or project work. This can foster sustainable activities in the region, for example regarding SDG N°2 and N°11 (zero hunger and sustainable production and consumption respectively). The transdisciplinary projects helped to raise awareness about the need for sustainable food circles on a regional scale. The outcome of awareness-raising is particularly fortified when outcomes of the course work are published by the local media.

Nevertheless, the impact on the region is restricted since the transformative teaching projects analyzed in this study often go back to the personal engagement of teachers in initiatives and personal connections to local communities. This observation is underlined by the study of Radinger-Peer and Pflitsch [5] who state that a strong influence on regional transition paths is often exerted by single highly engaged HEI individuals (so-called front runners) (p. 181). Therefore, the impact of HEI on regional transitions can be perceived as punctual and fragmented as seen in this study. According to Radinger-Peer and Pflitsch (ibid.), not only bottom-up motivation but a top-down consolidation is also necessary to unfold the potential of fostering regional transitions by HEI. Our findings show that to transform the regime level, stronger niches are necessary that interact and create networks in which change agents experiment with transformative solutions. Simultaneously, political willingness and resources at the landscape level are needed to give the niches a long-term perspective and to consolidate networks at the interface of science and society that are not dependent on personal networks only. Overall, also a change regarding values at the landscape level would be necessary that prioritizes the SDGs and sustainable development as critical perspectives at the decision-making level of HEI management and inside the ministries in the sense of a whole-institution-approach [33].

6. Conclusions

Certificate programs on sustainable development are an interesting yet unexplored subject. Their potential lies within building spaces—niches—for innovative teaching designs and possibilities to involve regional stakeholders. By combining different methods which include out-of-classroom-formats, they foster transformative learning environments in which students can discover sustainable alternatives, co-work, and discuss real-life solutions to sustainable challenges with the regional partners. Simultaneously, those teaching projects support regional transitions towards sustainability. In particular, they raise awareness about local sustainability problems and strengthen the networks of actors who are working on the SDGs. Nevertheless, some impacts such as the multiplier effects of students as future change agents might only be perceived in the long run. The regional partners benefit by participating in the transdisciplinary teaching projects as they gain new perspectives through dialogues with students or find new members or activists. In some cases, the encounters with students can even have empowering effects by giving their competencies and engagement more visibility and recognition. However, those teaching projects depend heavily on the individual and voluntary engagements and personal networks of teachers and regional actors and are based on trust and mutual understanding.

This study shows that such bottom-up motivation by individuals is not enough to protect the niche of certificate programs in the long term. Changes at the landscape level such as long-term financing and a clear prioritization of the SDGs and sustainable values by ministries and HEI are necessary to maintain transformative teaching spaces. The transdisciplinary teaching cooperation involves the engagement of different actors: certificate coordination, teachers, regional actors, and students. Here, one of the most essential challenges is the unequal power relations in terms of access to resources, financing, and determining of course planning. Simultaneously, co-design, mutual understanding, and collective decisions on roles and responsibilities and—especially—empathy and trust are crucial for successful teaching cooperation.

Moreover, the variability of situations in which transformative teaching projects can arise has to be taken into account. So, the performance of transdisciplinary teaching projects depends on the context and existing society-science-networks. This implies a need for analyzing the learning environments before designing courses. Hence, long-term perspectives that maintain and protect the institutional context of the niche are a key factor, so that the teaching projects could impact transitions on a regional scale and reliable transdisciplinary networks can be established. In that sense, the linkages of sustainability actors within the university and with regional stakeholders should be strengthened, for example via institutionalized network centers.

In conclusion, we state that certificate programs on sustainable education as innovative niches contribute to the vision of HEI as engaged universities. By creating networks at the science-society interface and linking local initiatives with global visions (SDGs), they find and reflect on solutions to regional sustainable challenges. There is a need for further research to investigate (with more case studies) how these niches could be strengthened on larger scales to bring in more sustainability perspectives at the level of regimes as a whole. Further, it would be interesting to include the student's perspectives on this in future studies.

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Appendix A

Questionnaire:

1. Wie ist die teaching cooperation zustande gekommen?
(English translation: How was this teaching cooperation established?)
2. Wie wurden die Entscheidungen zum Kursdesign und -inhalten getroffen?
(English translation: How were the decisions relating to the course design and its contents made?)
3. Auf welche Weise wurde der Praxispartner eingebunden, gab es dafür besondere Methoden?
(English translation: How was the practice partner involved, did it involve any special methods?)
4. Wie werden außeruniversitäre Lernorte integriert?
(English translation: How were the out-of-university spaces integrated?)
5. Was sind Faktoren für eine gute Zusammenarbeit zwischen Hochschule und lokale Initiativen? Welche Schwierigkeiten und Herausforderungen gibt es (in eurem Beispiel)?
(English translation: What are the factors for a good cooperation between the university and local initiatives? What difficulties and challenges are there (as in your example)?)
6. Thema Regime: In welchem institutionellen Rahmen bewegen Sie sich? / Welche Regeln/Institutionen sind ausschlaggebend für Ihre Arbeit?
(English translation: Regime: In which institutional framework do you operate? / which rules/institutions are crucial for your work?)
7. Was bedeutet nachhaltige Regionalentwicklung für Sie?
(English translation: What does sustainable regional development mean for you?)
8. Lock-in: Worin seht ihr Blockaden bzw. Barrieren für eine nachhaltige Regionalentwicklung? Wie sind diese mit anderen Ebenen verbunden?
(English translation: Lock-in: Where do you see constraints or barriers to sustainable regional development? How are these connected to other levels?)
9. Hat der Kurs zu längerfristigem Engagement von Studierenden bei der lokalen Initiative oder in ähnlichen Kontexten beigetragen?
(English translation: Has the course contributed to the long-term engagement of students in the local initiative or similar contexts?)
10. Aus Sicht der Praxispartner: Die Kooperation mit einem Uni-Kurs erfordert viel Zeit und oft ehrenamtliche Arbeit. Inwiefern "rechnet" sich das für eure Arbeit?
(English translation: From the perspective of the practice partners: Cooperation with a university course requires a lot of time and often voluntary work. To what extent does this add value to your work?)
11. Inwiefern hat die Zusammenarbeit Auswirkungen auf Region? Werden die außeruniversitären Partner nun von Politik/Medien anders wahrgenommen?
(English translation: To what extent does the cooperation have an impact on the region? Are the non-university partners perceived differently by politics/media?)
12. Inwiefern hat die koop zu eurer eigenen Entwicklung beigetragen?
(English translation: How has the cooperation contributed to your own development?)

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