

(Education for) Sustainable Development in Geography Education – Review and Outlook from a Perspective of Germany

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Nearly fifteen years after the Rio Conference and ten years after the Lucerne Declaration on Geographical Education for Sustainable Development we are interested to what extent the goals of this declaration have been implemented? What role does Geography play in Education for Sustainable Development in higher education? Therefore, we analyzed the modules of 107 degree programs with Geography as a degree major or as a teacher training subject at 55 German universities, technical colleges and universities of education. We conducted a quantitative text analysis in which we searched the key words “Sustainability”, “Sustainable Development”, “Education for Sustainable Development” and “Nature-Society Studies” in the Module Regulations. Our data indicate the existence of a great heterogeneity between the degree programs. The key words were predominantly found in majors in “Human Geography”, “Geography” and teacher training programs for “academic high schools”. In this article the conceptual aspects can be derived on the basis of results: (a) differences in the

orientation of degree programs, (b) varying degree of implementation in the modules, (c) different conceptual understanding of the principles of sustainability, (d) the concepts of Environmental Education and Education for Sustainable Development are individually and sometimes mixed and (e) heterogeneity between mandatory courses and electives.

1. Introduction

A Millennium Conference was held by the United Nations in New York in 2000; the so-called Millennium Declaration was adopted at its close. This declaration describes eight key Millennium Development Goals formulated by the international community to be achieved by the year 2015. These include eradicating poverty and hunger, achieving universal primary education, promoting gender equality, combating hunger and major diseases and ensuring environmental sustainability (UN, 2000). Within the framework of AGENDA 2030, a second contract for the future was adopted in 2015; it now states 17 Sustainable Development Goals (United Nations, 2016), the achievement of which all countries of the world community should contribute to. These 17 goals include the Millennium Development Goals already described in the year 2000 (inter alia, eradicating poverty and hunger, achieving gender equality). Moreover, the previous goals are differentiated further. This includes targets such as promoting shared prosperity, ensuring sustainable consumption and production patterns, maintaining the ecosystem and combating climate change. These goals are explicitly linked with the principles of sustainability (UNESCO, 2015). To provide people with the capabilities and skills that are required for acting in accordance with these goals, education is required that places the focus on the specified topics both in terms of teaching and learning. In this context, first the “UN Decade of Education for Sustainable Development (2005-2014)” (DESD) was declared in 2002 and then the follow-up “Global Action Programme” at the end of 2014. Both programs strive to achieve education in the sense of Sustainable Development (UNESCO, 2005a, 2014). To realize these objectives, Education for Sustainable Development should be anchored in all levels of the educational system as a matter of principle, i.e., from kindergarten to the university. The significance of universities and higher education in the implementation of Education for Sustainable Development is emphasized often (Barth & Rieckmann,

2016; Chalkley, 2006; Michelsen, 2016).

In Germany as well, efforts have been taken in recent years - particularly during the course of the Decade of Education for Sustainable Development (DESD) - to implement and anchor Education for Sustainable Development within the framework of the educational system. These are described primarily for the secondary level (Bagoly-Simó, 2013; Bögeholz, Böhm, Eggert, & Barkmann, 2013). To date, however, a systematic overview has not been presented on how Sustainable Development and Education for Sustainable Development are anchored in Geography in the realm of higher education in Germany. The present contribution addresses this task. An attempt is made here to illustrate implementation of Sustainable Development (SD) and Education for Sustainable Development (ESD) in the degree programs and modules offered by German universities. The intention here is to present a German perspective without making any claim of completeness. This must be explicitly emphasized, because not all requisite documents are always available and in addition, the development progresses continuously and rapidly; therefore this perspective can only be a snapshot. In 2007 the Lucerne Declaration on Geographical Education for Sustainable Development formulated by the International Geographical Union was signed to ascribe significance from a geographic perspective to this topic (Haubrich, Reinfried, & Schleicher, 2007). Nearly 10 years later it must be asked to what extent have the goals of this declaration been implemented? What role does Geography play in Education for Sustainable Development in higher education? These questions are addressed in the present contribution. It is investigated here which courses are offered in the context of Sustainability within the framework of various Geography degree programs in Germany. On the one hand this involves Geography as a major, on the other Geography teacher training degree programs. Within these degree programs, attention is directed toward determining the extent to which the terms Sustainability, Sustainable Development, Education for Sustainable Development and Nature-Society Studies are explicitly anchored in the individual degree programs.

1. Theoretical Background

1.1. Concepts of SD and ESD

A distinction is frequently drawn in the scientific literature between three different scientific approaches to Sustainable Development: unidisciplinary approaches, multidisciplinary approaches and integrative approaches (e.g. Grunwald & Kopfmüller, 2006). Often the discussions of this topic in both academia and society result in the creation of column models. It is now standard practice to use single-column and multi-column models—whereby in the latter case the three-column model (ecological, economic and social dimensions)—is the most widely-known (Carnau, 2011). The objective here is “[to consider] these dimensions of Sustainability as equal in importance, i.e., without permanently giving preference to any of the dimensions or questioning the legitimacy of their fundamental autonomy” (Carnau, 2011, p. 20). Grunwald and Kopfmüller (2006) prefer multi-column models for the following reasons:

1. “Implementation of the equity postulate and the perception of responsibility in principle require the inclusion of all dimensions of societal development.
2. The ethical question of what legacy future generations have a claim to and which risks for societal development should be avoided cannot be answered in a strictly ecological context. In addition to the basic needs for physical survival, economic, social and cultural values constitute resources that collectively form the basis for satisfaction of human needs” (Grunwald & Kopfmüller, 2006, p. 46).

Carnau (2011, p. 20) voices criticism that the holistic nature of interrelationships between the dimensions can be integrated in the long term only with great difficulty and that the system is very complex. Nolting (2005, pp. 175-176) recognizes in this very complexity numerous possibilities for interdisciplinary research as well as research theories and the strength of the concept, “because realization of normative ideas always involves dependence on temporal, situational and knowledge factors” (Nolting, 2005, p. 178), and the concept should always be observed in a dynamic, recursive manner (Nolting, 2005).

Thinking in the interest of Sustainable Development should be conveyed to children and adolescents starting as early as kindergarten and continuing on through all levels of the

educational system. The fundamental concept of this is known as Education Sustainable Development (ESD). At its core, ESD means conveying the principles and values of Sustainable Development:

„The overall goal of the DESD is to integrate the principles, values, and practices of sustainable development into all aspects of education and learning. This educational effort will encourage changes in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations“ (UNESCO, 2005b, p. 6)

In terms of its conceptual structure, the principle of Sustainability exists along with other structural aspects such as intergenerational and intragenerational justice. In addition, there are topical content fields, for example, climate change, biodiversity, disaster risk reduction or sustainable consumption (UNESCO, 2005b, 2014). In the German-speaking region, the concept of “shaping competence” has attained great importance with regard to ESD. Shaping competence

„means the specific capacity to act and solve problems. Those who possess this competence can help, through their active participation in society, to modify and shape the future of society, and to guide its social, economic, technological and ecological changes along the lines of sustainable development“ (de Haan, 2006, p. 22).

In the field of higher education, teacher training for tomorrow’s teachers is of crucial importance. Schrüfer, Hellberg-Rode, and Hemmer (2014) point out that teachers must have a particularly solid professional knowledge to elaborate lessons that are in line with the concept of ESD. This is based on various theoretical concepts, such as the dynamic model presented by Sleurs (2008) on the ESD competencies of teachers. Under consideration of various theoretical concepts Schrüfer et al. (2014) performed a Delphi study to identify the specific professional knowledge which teachers should have in the context of ESD. Initial results indicate that the persons who were interviewed formulate deficits in the context of ESD competencies. Many teachers are obviously not familiar with the concept.

1.2. Development and Implementation of SD and ESD

McManus (2004), in his analysis of U.S., Australian, and British degree programs, concludes that Geography has integrated Sustainability in four fields of teaching:

“These are to address it within an existing environmental course that is not focused on normative values; to address the concept within a course that is focused on wider development or management concerns; to develop new courses on sustainable development but to interrogate this notion within the course; or to develop a new programme (usually at the postgraduate level) that focuses on sustainable development.” (McManus, 2004, p. 225) He furthermore proposes that chapters on Sustainability be implemented in higher education textbooks and reference works for Geography students to sensitize them to this topic. Nevertheless Sustainability has in his opinion hardly been anchored in Geography to date. The history of geographic thinking, the structure and culture of Geography as an academic discipline at universities, other new Geography research and teaching fields as well as the culture of third-party funding, which may indirectly influence teaching are to be blamed for this. Seven years later Liu (2011) still arrives at the conclusion that when the topic “Sustainability” is taught in the context of higher education, Geography does not play the role one would presume in the case that man-environment relationships formed the basis of Geographic thinking. He argues that “geography should be central to the interdisciplinary sustainability curriculum”. Causes for this may include the fact that Human Geography considers this the task of Physical Geography and vice versa. Also the high degree of specialization within the various subdisciplines of Geography are an obstacle to the development of curricula that have a strong focus on the field of sustainability or to achieving “greening the curriculum” (Haigh, 2005; Higgitt, Haigh, & Chalkley, 2005). Bednarz sees an important core of Geography in “man-land, human-environment, or environment-society relationships” (Bednarz, 2006, p. 237). It would therefore be logical “that [geographers] see their discipline as an appropriate home for environmental or sustainability education and research” (Bednarz, 2006, p. 237). Liu (2011), however, sees a deficit in this particular aspect especially in U.S. Geography and advances in Geography in the U.K. and in Russia. It must be stated that Germany is not being investigated in this context. Other disciplines outside of Geography have directed their attention to this topic (for example, Geosciences, Environmental Sciences, Engineering) and created intradisciplinary or interdisciplinary links outside of Geography (see Bednarz, 2006). He concludes that even if Geography were to succeed in intensifying expansion of its research in this topical field, that would not automatically also result in a more in-depth treatment of “Sustainability” in teaching. Doing so could make it possible for sustainability to assume an important role in the

field of teaching by conveying complex topics so as to stimulate students and thus to merge theory and practice (vgl. Dengler, 2008) and to again achieve an intermeshing of social, economic and ecological topics, i.e., to arrive at an integrative, holistic Geography (Yarnal & Neff, 2004). An evaluation of the literature reveals that in the field of higher education, even after more than ten years since the commencement of such discussions, hardly any changes have occurred and that deficits still exist as Liu (2011) clearly emphasizes.

In Germany, sustainability topics and concepts in particular can be found in the field of education since the 1990s; previously the concept of Environmental Education was the dominant principle (Bögeholz et al., 2013; Leal Filho, 2015). We build on this development, even though various opinions exist on the relationship of Environmental Education to Education for Sustainable Development; a detailed discussion of this has been presented by Kopnina (2012). During these years, corresponding targets and requirements arose, which have driven implementation of the concept of “sustainability” forward in the educational system. A very good overview of national and international declarations, charters, networks and programs in higher education is given by Michelsen (2016). It becomes clear in his contribution that especially since the 1990s a continuous increase in declarations and networks is evident. As these requirements were imposed, numerous programs were established in Germany and also internationally to strengthen and promote the competencies of Education for Sustainable Development. The BLK Program “21” (of the Bund-Länder Commission for Educational Planning and Research Promotion) from 1999 to 2004 (de Haan, 2006) and the follow-up program “Transfer-21” from 2004 to 2008 were of central importance to Germany. In the context of these programs, Education for Sustainable Development focuses on acquiring subcompetencies that are bundled in the concept “shaping competence” referred to in the foregoing (de Haan, 2006). It must be noted, however, that many of these projects and programs which emerged in Germany during the course of the decade initially pertained to the field of secondary education.

Bardsley (2004) by contrast analyzed secondary and tertiary sustainability education in Geography and summarizes his results as follows: “By making issues of social and ecological sustainability the focus of geography, the values, the skills and knowledge taught have a focus that empowers the subject to exist in its own right, drawing from, but aside from all others. The interpretations and methods of teaching sustainability will

and should vary between schools, universities and individual teachers.“ Bardsley (2004, p. 37). Concerning the U.K., Chalkley, Blumhof, and Ragnarsdóttir (2010) describe implementation of ESD in the module name of Geography degree programs at English universities in a brief section. The authors illustrate this by stating the names of individual modules. These include, for example, Geography and Environment, Global Environmental Issues and Global Climate Change (Chalkley et al., 2010, p. 95). It does appear, however, that these insights are based on selected examples and not on a systematic research effort.

The effectiveness of curriculum reorientation steps taken to date toward propagation of sustainability topics and concepts in higher education has been shown by several studies. Summers, Corney, and Childs (2004) have investigated student teachers' conceptions of sustainable development. They were able to show that the majority of students who responded to questionnaires mention the economic, ecological and social dimensions in line with the three-column model, but frequently place emphasis on the ecological dimension, however. At the same time, these authors stress the necessity of further critical examination of the concepts. Similar argumentation is also presented by Leal Filho (2015), who demonstrates that despite the numerous projects conducted in the past, the institutions of higher education are lagging behind in the field of ESD. Reasons for this that he states are the lack of a critical mass in terms of teaching personnel, the lack of strategic objectives and a lack of willingness to shift sustainability topics into the focus of university degree programs (Leal Filho, 2015).

As far as the implementation of sustainability topics and concepts is concerned, no comprehensive overviews have been presented to date; this applies above all in the field of higher education. Bagoly-Simó (2013) has published a depiction of the implementation of ESD in secondary education. He performed a comparison of Bavarian, Romanian and Mexican curricula. Even though his study was performed at the level of lower secondary education, his results are of relevance in that he was able to demonstrate that in the field of Bavarian curricula, Geography is the subject with the highest share of topics Bagoly-Simó (2013). To what extent this could be transferred to all German federal states or to higher education must be the subject of future investigation.

1.3. Sustainability and ESD in Higher Education

Müller-Christ (2011) investigated the extent to which the concept “sustainability” is anchored at German universities; he did not specifically deal with the subject Geography. He states a total of ten fields of action in which “sustainability” can play a role in further development in higher education. Fields of action that he mentions include “higher education courses with sustainability topics that are offered as mandatory courses or mandatory electives for degree programs” and “higher education courses with sustainability topics that are offered as cross-disciplinary electives for degree programs”.

The great importance of universities in conveying Education for Sustainable Development is frequently emphasized, because universities in particular have a key strategic position due to the large number of graduates (Chalkley, 2006; Leal Filho, 2015). At the university and college level in Germany, sustainability topics and concepts are conveyed in the major subject Geography on the one hand and in teacher training programs on the other. Due to the variety of layers of the German education system this is briefly presented here with regard to Higher Education. A good overview of the education system in general can be found on the pages of the European commission (Eurydice, 2016). Before starting their study, students have to make a decision whether they want to study Geography for major or for teaching. These are basically two different degree programs from the beginning. In addition, there are smaller differences within countries, as the educational sector in Germany is in the responsibility of the countries. Generally, studies can be done for major at universities or technical universities. A teacher training degree program can be completed at a university (most common case), a technical university (rarer) or at a university of education (this is still only in the case in the state of Baden-Württemberg). The degree program culminates either in a standardized state exam or a Master of Education.

Despite the standardization of certain organizational structures by the so-called Bologna Process, there is no uniform structure in the field of major subject degree program requirements in Germany. Each university sets its own focal points, both in terms of the fractions of Physical Geography, Human Geography, Geography Methods, Regional Geography and Integrative Geography as well as the resultant differentiation then made in terms of content. A similar development is also evident in the field of teacher

training. In this field no standardized educational system exists in Germany, consequently there are differences in the names of the degrees awarded and the types of institutions that offer teacher training as well.

3. Methods

The present study pursues the objective of obtaining an overview of how sustainability concepts are implemented in the higher education subject of Geography at universities in Germany. To this end, systematic research was performed to investigate implementation at several levels (Figure 1):

[Figure 1 near here]

Figure 1: Steps of the methodical research performed

An initial step identified the locations of higher education institutions where it is possible to study Geography as a master's program major or for teacher training. Doing so utilized the database of locations that can be accessed via the website of the German Geographic Society (DGfG) (Deutsche Gesellschaft für Geographie, 2015) as a basis. Institutes that submitted corresponding notification to the DGfG are included a list posted on this website stating all locations where a Master of Geography is offered. This includes unidisciplinary, subdisciplinary (for example, degree programs that only involve Economic Geography) as well as interdisciplinary degree programs with a heavy emphasis on Geography (e.g., Biogeosciences). Owing to their heterogeneity and the associated data volume, bachelor degree programs with a major in Geography were excluded from further analysis and only Geography teacher training degree programs were analyzed. In addition, the authors also supplement these data with the results of other research as well as their own knowledge on additional degree programs. It was possible to identify a total of 55 higher education locations at which degree programs are offered for Geography as a major or as a teacher training subject. After these study locations were identified, systematic research was performed on these 55 locations that offer a total of 107 degree programs with Geography as a degree major or as a teacher training subject. This involved searching the associated Module Regulations and/or

Manuals for the degree programs that are of relevance to Geography. These Module Regulations and/or Manuals are the official documents to guide students through their degree program as well as to inform all potential students about the concrete details. Therefore, if sustainability is an important concept in the degree program it should be mentioned in these documents. Module Regulations and Module Manuals were checked for the occurrence of the following key words:

- Sustainability
- Sustainable Development
- Education for Sustainable Development
- “Nature-Society Studies”.

Surely, it might be that a university is not mentioning these keywords, but describing them, however, then the importance of the concept is not at the forefront of this degree program. Therefore, we decided that it is a must to be named as such to show the real intensive role that sustainability plays in this degree program. If a relevant key word is found in the Module Regulations, the name of the corresponding module, the name of the degree program and the degree that can be earned were recorded. The next step was to perform an analysis of these modules and degree programs. A quantitative text analysis was performed for this purpose; i.e., after searching for key words and word combinations in the body of text of the Module Manuals, topical categories were formed and then enumerated (see Meier-Kruker & Rauh, 2005).

4. Results

At first glance these data indicate the existence of a great heterogeneity regarding treatment and implementation of sustainability topics and concepts at German universities. The spectrum ranges from degree programs that do not use sustainability concepts directly in their module structure to degree programs whose names actually include the word “sustainability” (for example, Sustainability, Society and the Environment). There are also university locations that offer a comprehensive sustainability concept, without explicitly referring to it in the name of the degree program. This is manifested not only by anchoring the concept in degree programs and modules, but rather also in the focus of professorships and up to anchoring in the guiding principles of higher-order centers at the respective university. There is a relatively broad range between these, in which individual aspects implement the

concept of sustainability, frequently in individual modules or courses.

Selected results are depicted in the following. The graphic in Figure 2 depicts data on universities with modules explicitly related to sustainability that are offered for various degree programs. This figure shows the number of modules related to the concept of sustainability. Here it was investigated whether the terms Sustainability, Sustainable Development, Education for Sustainable Development and Nature-Society Studies occur in the modules. In this search multiple occurrences are permissible, consequently there are universities that offer modules in the field of sustainability and in the field of Education for Sustainable Development, for example.

[Figure 2 near here]

Figure 2: Universities with modules in the context of “Sustainability”

It becomes clear that the concept of Sustainability is mentioned most frequently in the modules of universities, followed by the terms Nature-Society Studies, Education for Sustainable Development and Sustainable Development. Furthermore it becomes evident that there are 17 universities that do not mention the concept in their Geography modules, at least not explicitly.

The next step was to consider the degree programs with relevance to sustainability. In Figure 3 results are depicted for the Master of Geography major, in Figure 4 results are presented for the teacher training degree programs.

[Figure 3 near here]

Figure 3: Master of Geography degree programs related to sustainability (major only)

It is evident from the results gathered for the major that relevance to sustainability is primarily present in the degree programs Human Geography and Geography (10 degree programs in each case). Interdisciplinary degree programs that are related to Geography, Economic Geography and Applied Geography each include eight occurrences; Physical

Geography and Environmental and Sustainability Sciences with seven occurrences each are other degree programs in the context of sustainability. In addition, the concept of sustainability also occurs in the field of Area Studies, Education and Sustainability (in this field there is one degree program with explicit reference to Education for Sustainable Development) and Climate Science. The same evaluation was then performed for the teacher training degree programs (Figure 4):

[Figure 4 near here]

Figure 4: Degree programs related to Sustainability (teacher training only)

It is evident from the results that the concept is always anchored in the teacher training degree programs for the subject Geography, albeit to a varying extent. It occurs especially frequently in degree programs for *Gymnasium* (academic high school) teacher training (anchored in twelve degree programs) and *Grundschule* (elementary school) teacher training (anchored in nine degree programs). ESD concepts are explicitly anchored in the degree programs for teacher certification for *Realschule* (middle-track secondary school) with four occurrences and *Sekundarstufe 1* (Secondary Level 1) with five occurrences. It must nevertheless be mentioned at this point that both of the latter are degree programs for training Middle School Level teachers, both degree programs are relevant to a similar level in the school system (grades 5-10). Differences in nomenclature arose from the different designations for types of school that evolved from the federalist system in the field of Education; these are reflected at the respective university locations.

Because of the great significance of higher education depicted as in the foregoing sections and an associated multiplier effect for the concept Education for Sustainable Development, an additional evaluation was performed that focused on the concept of ESD (Figure 5). In this evaluation, identical modules offered at a given university were only counted once for that location. This means that a module at a particular university location where several teacher training degree programs are offered was only counted once in this evaluation. If an identical module such as “Fundamentals of Geography Education” is offered in four degree programs at one location and thus anchored in each

of those degree programs, it is only counted once in this analysis.

[Figure 5 near here]

Figure 5: Designation of modules explicitly related to ESD

It is evident here that the concept of ESD explicitly occurs in the Geography major degree programs as well as in the Geography teacher training degree programs. The latter group is the largest by far. The largest group within the modules comprises modules on Environmental Education and/or Education for Sustainability, these are frequently even named Education for Sustainable Development. Within these modules, the concept is anchored in eight modules (teacher training degree programs) and also in four additional modules for Geography major degree programs. Another large group that as a rule is only encountered in teacher training degree programs includes a total of twelve modules pertaining to Geography Education. A distinction is drawn here between introductory or basic modules and advanced modules. In two cases the concept is also integrated into practicum experience courses. In certain individual cases the concept occurs in courses offered for Geography majors.

5. Discussion

It was already pointed out in the introduction that the results presented here constitute a snapshot and that the landscape of education is subject to a process of continuous change. These results nevertheless give one a good understanding of the degree and intensity of implementation of concepts that are related to sustainability in the realm of higher education. Concepts that are relevant to sustainability can be found in the subject of Geography at the majority of universities in Germany; this is not only the case at universities but also at technical colleges and universities of education. This means that there are also institutions of higher education that at least do not explicitly pursue the concept. At this point, in agreement with Leal Filho (2015), one can say for the subject of Geography that at least there is still potential for intensified implementation in the future. On the other hand it is evident that the concept is anchored in the Geography

major degree programs as well as in the Geography teacher training degree programs. This implementation process began during the UN Decade and is currently still in progress. In particular those Module Regulations that are currently taking effect include the concept of sustainability or ESD. It can therefore be stated, for example, that the call for greening the higher education curriculum formulated by Higgitt et al. (2005) has at least been achieved in terms of intensified implementation of the concept of sustainability. As already described by Bardsley (2004) interpretation and elaboration of the concept cover a very broad range, however. In the present investigation, the following conceptual aspects in particular can be derived on the basis of results:

- *Differences in the orientation of degree programs:* Investigation results already exhibit the differences in the orientation of the concept described by Bardsley (2004) at the level of the degree programs. There are degree programs that include the concept Sustainability, Sustainable Development or Education for Sustainable Development in their names and one can thus recognize their relevance to sustainability at first glance. It must therefore be assumed that these degree programs involve a very strong orientation toward sustainability concepts. Other degree programs, by contrast, are more general (e.g., Geography or Human Geography). A direct relevance to sustainability concepts thus cannot be immediately recognized; a more in-depth look at the Module Manuals reveals that this relevance can, however, be recognized. It has nevertheless not become evident from these data to date that Liu's call for a "central role" (Liu 2011) of Geography in the sustainability sciences has already been achieved.
- *Varying degree of implementation in the modules:* The situation is also similar in the context of the modules: Here too there is a very broad range with different focal points, these are similar to those of the selected examples that Chalkley et al. (2010) described. There are modules that have Sustainability, Sustainable Development, Education for Sustainable Development or Nature-Society [Studies] as their entire title, i.e., modules whose overall orientation is directed toward the corresponding construct. On the other hand there are modules with entirely different names (e.g., Geography or Introduction to Geography Education) and the concept relevant to sustainability is included as one of many aspects of the module content. The scope and diversity of content taught there are considerably narrower in the second case. It

would be necessary at this point to take a more in-depth look that focuses on the concrete contextual structure of the modules; such a look is not possible within the framework of this article.

- *Principle of sustainability—sustainability topics*: If one follows the concept of sustainability, e.g., in line with the column module that Carnau (2011) described, balanced consideration of the economic, ecological and social dimensions is a central aspect. The extent to which these three dimensions are in fact considered equally must remain open at this point. The findings presented by Summers et al. (2004) suggest that while some students do consider all three dimensions of sustainability, it appears that frequently such consideration is lopsided and only the ecology dimension is actually conveyed. With a view toward implementation, consideration must also differentiate between the principle of sustainability and topics in the context of sustainability. If one examines the degree programs or modules exclusively on the paper level, it cannot always be clearly determined to what extent the guiding principle and its principles per se or rather “merely” the content topics are primarily considered without explicitly referring to the guiding principle.
- *Environmental Education—Education for Sustainable Development*: In a few cases a link is still established between ESD and the related concept environmental education. The different perspectives of these two concepts described by (Kopnina, 2012) can also be found in our results. There are degree programs that contain both terms/concepts; there are also degree programs that only refer to sustainability and do not consider environmental education. It should be mentioned at this point that it would be expedient to conduct more detailed analyses to consider the elaboration of content in a more differentiated manner.
- *Mandatory courses/electives*: There are essentially two types of modules in the degree programs investigated: Mandatory modules that must be completed by all students; the chance that sustainability concepts are conveyed to students is very high here. By contrast there are modules that can be taken as electives but are not mandatory. Here it would be interesting to determine whether students are fundamentally interested in a specific module and insufficient slots are available or whether students are simply more interested in another elective.

Very different reasons may exist for the differences in elaboration and implementation depicted here: These can be seen in the *heterogeneity of the educational system*. The educational system in the realm of higher education in the subject Geography is by no means uniform. Topics and concepts that are relevant to sustainability were encountered not only in the degree programs at universities but also at universities of education and technical colleges. These institutions of higher education have very different focal points and orientation of content, differences in structure and emphasis are thus absolutely unavoidable. A further reason may be the *entry into force of the Module Descriptions and Manuals that are now valid*. Module Regulations at a few institutions are now already many years old and have not been correspondingly updated, others only came into effect a few weeks ago. It is therefore possible that a reorientation of the curriculum will soon be commenced. Whether or not concepts that are relevant to sustainability will be given consideration must remain open at this point.

A further reason for the fact that implementation has not been performed systematically to date may be the lack of willingness mentioned by Leal Filho (2015). On the one hand this can be due to the university programs he mentioned, it can also be due to a lack of willingness (to date) on the part of the academic teaching community to implement corresponding concepts. It is also conceivable that the scope of personnel resources is simply not sufficient.

The following points must still be critically addressed: In the present investigation the focus was placed on an explicit anchoring of the concept of sustainability. At this point one must draw a distinction between an explicit relevance to sustainability and one that is implicit. In some cases Module Regulations provide flexibility for including sustainability topics in ESD but do not explicitly prescribe this. One can clearly illustrate this using the example of Geography Education: The principle of Sustainable Development is often explicitly mentioned in the modules. In a few cases the module description mentions the current guiding principle of Geography Instruction (which could be Education for Sustainable Development, however this was not considered in the present investigation). Even though it is not explicitly mentioned, the instructor of the respective course may very well deal with it as a topic. At this point more in-depth investigations that go beyond the paper level would be desirable.

As already noted repeatedly, this article is a snapshot. Shifts in the results can therefore

already be expected in the near future. Fine tuning of university-level curricula is an “on-going construction site”, the process will never end. The point in time when such an analysis is made is thus inconsequential; at any given subsequent point in time such an investigation will also remain a snapshot. To strengthen sustainability topics in Geography and to strengthen teaching of the subject Geography in the future, it would be desirable to see announcement of an increasing number of professorships that have an integrative teaching and research profile - initial steps in this direction have already been observed in Germany in recent years.

6. Conclusion and Outlook

The present contribution pursues the objective of performing a systematic analysis of how the concept of sustainability is implemented in the realm of Geography in higher education. In doing so, consideration was given both to Geography as a major in degree programs as well as Geography teacher training degree programs.

In consequence of the results, the following measures can be deduced:

1. Explicit extension of SD and ESD concepts: The results show that there is some need to intensify the implementation of the sustainability concept. This is especially evident in degree programs where close reference to sustainability is urgently required. Regarding teacher education, it is important to mention special education (see figure 4) at this point. In this degree program, that educates teachers for special schools, the idea of inclusion is of extreme importance. Therefore the integration of concepts of sustainability is strongly advised, since the direct link to the 17 Sustainable Development Goals (United Nations, 2016) is given. Regarding modules (see figure 5), intensification is particularly needed in courses related to school practicum/internship. This must be seen against the background that teachers have a considerable multiplier effect and that these multipliers have to be familiarized with the concepts, which is also shown as a central field of action in the Global Action Programme (UNESCO, 2014).
2. Enhance transparency with regard to applied sustainability concepts or theories: It would be desirable if, for example, the module manuals were more transparent in

showing which precise concepts emerge behind a degree program related to sustainability. Often, it does not reveal whether and to what extent sustainability concepts or theories constitute the theoretical framework. Among them, the concept of shaping competence (de Haan, 2006), the Sustainable Development Goals (United Nations, 2016) or the three-column model (Carnau, 2011) can be named.

3. Further training of staff: As already noted by Leal Filho (2015), the willingness of the teaching staff to implement appropriate concepts is not always present. A lack of staff resources can also be a cause. At this point, further training and further education programs must be set up to demonstrate the possibilities for the implementation of sustainability concepts in university courses.
4. Intensifying research on teaching and learning conditions of Education for Sustainable Development: Research activities in the field of ESD have taken place so far. This research was conducted e.g. in the area of knowledge, understanding, and ideas about Sustainable Development (e.g. Summers et al., 2004). However, there are far more research desiderata in this area. In particular, studies of effectiveness and intervention studies are lacking to show which methods in university teaching courses can provide a good support for the promotion of sustainability.

It became evident that the concept of sustainability is already being implemented at numerous locations, however in very different forms. At the same time, results have indicated that further studies are desirable in this field. A comprehensive investigation of bachelor degree programs with a major in Geography is definitely also important, because frequently the fundamentals are laid there on which students build and develop a more advanced and in-depth interest and perhaps decide to enroll in a subsequent Master of Geography program. In this investigation we restricted our attention to the subject Geography. When performing research we automatically came across other disciplines and their respective relevance to sustainability. Due to the scope, it was not possible, however, to include these data in the present investigation. A comparison with other subjects in this regard would be very interesting. Basing the present investigation on paper is a (necessary) limitation. We restricted ourselves to the analysis of documents, it would be very expedient to present good concepts and case studies and then derive statements on their effectiveness.

Left-overs for future research are especially a more in-depth look on the concrete contextual structure of the Module Manuals and each module. Moreover, a large quantitative survey of all degree programs involved in this research would give another inside into the concepts of sustainability used in the degree programs as well as the intensification of the use of sustainability concepts in the programs. This survey could include degree program directors or other persons responsible for the degree programs as well as students to analyze whether the sustainability concepts are realized and reason for choosing especially this program. It would support to determine whether students are fundamentally interested in these concepts and what they define as sustainability. Also additionally qualitative guided in-depth interviews with degree program directors and degree program teachers would support future investigations into the education for Sustainable Development. Even though this research is conducted in Germany, more comparative studies with other countries and their higher educational systems can bring added value to the research on sustainable development in Geography Education.

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