Article

Implementing ESD in Schools: Perspectives of Principals in Germany, Macau, and the USA

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Abstract: To successfully cope with global challenges such as climate change or loss of biodiversity, it will require a substantial change in the ways societies make use of the natural resources of our planet. Education for Sustainable Development (ESD) is expected to support the transformation of societies towards more sustainable ways of thinking, working, and living. Although there is a broad range of literature on ESD, little is known about the role of school leadership in ESD. However, leadership is crucial for the implementation of ESD in schools. This article gives a short overview of the status of ESD within Germany, Macau, and the United States and a literature review on leadership for ESD in schools. It reports on a study that seeks to investigate what principals do in Germany, Macau, and the United States; specifically, what management strategies they use and which competences they need to successfully establish ESD in their schools.

Keywords: education for sustainable development (ESD); school leadership; principals

Citation: Müller, U.; Hancock, D.R.; Stricker, T.; Wang, C. Implementing ESD in Schools: Perspectives of Principals in Germany, Macau, and the USA. *Sustainability* **2021**, *13*, 9823. <https://doi.org/10.3390/su13179823>

Academic Editors: Werner Rieß, Christoph Mischo and Katja Scharenberg

Received: 13 July 2021

Accepted: 23 August 2021

Published: 1 September 2021

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1. Introduction: Sustainability and Education for Sustainable Development (ESD)

Against the background of major global challenges such as climate change, loss of biological diversity, hunger, poverty, migration, and many others, Sustainability has become a guiding societal value and Sustainable Development the official goal of many countries on the planet. At the Earth Summit in Rio de Janeiro in 1992, government officials from more than 170 countries came to an agreement on the need for “Sustainable Development” as a guiding principle. Since then, various follow-up conferences have worked and continue to work on achieving agreement on concrete steps and measures. In 2015, the international community of 193 nations once again committed itself to sustainable development and formulated 17 global goals (with 169 sub-goals) for sustainable development (SDGs—Sustainable Development Goals) [1,2].

There is widespread agreement that education plays a crucial role in developing sustainable societies and achieving the SDGs. “Qualitative Education” is one of the seventeen goals but is also expected to support all other goals [3,4].

Education for Sustainable Development (ESD) is an educational program that empowers people to think and act for the future. It enables each individual to understand the effects of their own actions on the world and to make responsible decisions. In 2002, the General Assembly adopted a resolution to begin the UN World Decade of Education for Sustainable Development, which ran from 2005 to 2014 [5]. Despite criticism (e.g., [6], the program has led to numerous innovative projects and helped ESD progress a long way. However, it became apparent that it is not only a matter of addressing sustainability issues in individual projects and in teaching, but also of structurally initiating sustainability in the organizations themselves [7] (p. 3), taking the “step from project to structure” [8]

and comprehensively integrating sustainability principles into education and training contexts [9] (p. 15).

Therefore, in the Global Action Program “Education for Sustainable Development” (GAP), the successor to the UN Decade of ESD, as well as in the latest program “ESD 2030—Towards achieving the SDG” [10]. UNESCO defined ESD as “holistic and transformational education which addresses learning content and outcomes, pedagogy and the learning environment” [9] (p. 17). “Transforming learning and training environments” is one of the five priority fields of action: “ESD is about much more than preaching and teaching on sustainable development. It is also about practicing sustainable development. Sustainable learning environments, such as eco-schools or green campuses, allow educators and learners alike to integrate sustainability principles into their daily practice. Transforming learning and training environments concerns not only managing physical facilities more sustainably, but also changing the ethos and governance structure of the whole institution” [9]. Additionally, “ESD 2030” expressly addresses the role of education to support the SDGs [11].

1.1. Goal of the Study

Sustainability, the SDGs, and ESD are issues that can only be successfully tackled on a global scale. It is necessary to develop across the board perspectives and international cooperation. With our study we want to explore the relatively new research field of school leadership for ESD within the three countries/regions in which we are living and working and take an initial look into practices of school leaders. In a first step we give a short overview of ESD within Germany, the USA, and Macau. These countries/regions are very different in context and difficult to compare. Therefore, we focus in particular on the question of how each of the countries/regions relates to the UN programs on ESD (World Decade of ESD, Global Action Program, ESD 2030). We then refer to a model for School Development as theoretical background for fostering ESD in schools and report on an explorative empirical study to capture some insights by interviewing principals within the three countries/regions.

1.2. ESD in Germany

Germany has a long history of environmental education, the predecessor of ESD, which started in the 1970s. Pioneers in schools developed new concepts and started with activities such as school gardens and programs for recycling, energy saving, and water protection. However, environmental topics were primarily addressed in subjects such as biology and geography and the aforementioned activities were most often initiated and driven by individual teachers. After the World Summit in Rio, discussions on ESD and a shift from environmental education to ESD [9] started but has only gained momentum after the Johannesburg Summit in 2002 and during the period of the ESD-Decade (2005–2014). The German Federal Ministry of Education founded the ESD Committee for the UN Decade, comprising experts from diverse fields, and invited interested parties from the private sector, research, and civil society to participate in a round table [12] (p. 14). The committee developed the German Federal Government’s National Action Plan on ESD [13]. During the ESD Decade, a considerable number of ESD projects was carried out by schools, NGOs, and other institutions and initiatives. Over 1900 projects were awarded recognition as official projects of the Decade [14] (p. 23). After the Decade, during the GAP period (2015–2019), a multi-stakeholder process was started to further develop the National Action Plan, which was adopted in 2017 [15]. The plan now expressly addresses the SDGs and describes areas, objectives, and measures for the main sectors of the education system [15] (p. 4).

In recent years, a broad scientific discussion on ESD in Germany has developed, focusing on topics such as competence models, contents, didactical principles, and teaching methods for ESD [16]. Empirical data on ESD are relatively scarce, but progress in ESD is monitored and reported [17]. For several thematic fields, indicators are developed to monitor progress, e.g., for teacher training [18].

One study showed that during the ESD Decade and the GAP, ESD has made substantial progress in terms of integration into formal documents of the education system such as education acts or school curricula, but there are still strong differences between the 16 states [19]. Other studies point out that it is still not possible to assume that ESD and sustainability are widely implemented in schools. A large-scale study (a survey of 2564 14–24 years old) showed that only less than 9% of the time spent teaching and attending seminars had clear references to sustainability (cf. [20], p. 4). Furthermore, it became apparent that it is still predominantly committed individuals who practice ESD. A broad and structural anchoring can by no means be assumed (ibid.).

Only recently organizational development of schools towards sustainability and the role of school leaders were taken into consideration. Grundmann [7] conducted a study on the implementation of ESD involving teachers and principals, and Müller, Lude, and Hancock [21] developed a conceptual framework for integrating ESD in schools. Following the GAP, the Whole-Institution Approach is considered as a guideline for ESD [16]. The German Federal Government's National Action Plan on ESD mentions the "development, testing, consolidation and dissemination of qualification concepts for leaders" in the various learning environments as an important goal [22] (p. 43).

1.3. ESD in USA

In recent years, several high-level efforts have sought to explore and develop Education for Sustainable Development (ESD) practices and policies in the United States. In 2003, the U.S. Partnership for Education for Sustainable Development was created with almost 100 participants from a diverse range of sectors including K–12 and higher education, science and research organizations, conservation and environmental NGOs, faith communities, living institutions, youth advocacy organizations, and government agencies. Convened by the National Council on Science and the Environment and University Leaders for a Sustainable Future, the group met to respond to the call by the United Nations General Assembly for a Decade of Education for Sustainable Development (2005 through 2014) and to consider specifically: (1) how the Decade could be leveraged to advance ESD in the United States; (2) opportunities for collaboration within and across sectors; and (3) how widespread engagement in the Decade by U.S. organizations could be facilitated [4].

In another high-level initiative, the U.S. Department of Education Green Ribbon Schools program was created in 2011 to recognize public and private elementary, middle, and high schools, districts, and postsecondary institutions that demonstrated leadership in: (1) reducing environmental impact and costs, including waste, water, energy use, and alternative transportation; (2) improving the health and wellness of students and staff, including environmental health, nutrition, and fitness; and (3) providing effective sustainability education, including robust environmental education that engages STEM, civic skills, and green career pathways. This program sought to expand ESD efforts to more schools and institutions across the country [23].

The Global Action Programme (GAP), established by the United Nations Educational, Scientific, and Cultural Organization (UNESCO), existed from 2015 to 2019 and sought to improve ESD awareness and training in multiple countries, including the United States. GAP established five ESD-related goals: advancing policy, transforming learning, building an educator knowledge base, empowering youth, and implementing sustainability measures. Through GAP, environmentalists associated with the U.S. Partnership for ESD sought to accelerate progress toward ESD in many educational environments in the U.S. [24].

Despite these initiatives, ESD is still only starting to evolve in the United States. Very little empirical research exists on the topic and literature on the role of educational leaders in ESD implementation is scant. As recently as 2013, Veronese and Kensler [25] high-lighted the dearth of information available on school leaders' efforts towards green schools in the U.S. Mogaji and Newton [26] found that almost all ESD research in the U.S. has been conducted since 2015 and that there still exists limited knowledge concerning the role of a school principal in initiating ESD. Complicating the issue is that approaches and assessment

methods for research in ESD are vast and still in an early stage of development [23]. How do sustainable schools integrate sustainability education? In order for procedures and practices on ESD to be further developed and implemented, U.S. policymakers must have a better understanding and more evidence of ESD's educational contributions [4,11].

1.4. ESD in Macau, China

Many efforts have been taken related to sustainable development in the Chinese context [27]. It is considered an essential area in the new Chinese educational reform, and the SDGs can only be achieved with the awareness of environmental protection and more knowledge about eco-friendly behavior [28]. Zhang [29] stated that ESD now has become a unique education innovation with increasing recognition in China. China has accomplished transforming the international concept of ESD into a Chinese concept, conducting action research, and making policy issues [30].

In mainland China, one notable experience was the large-scale national environmental education (EE) project conducted by three organizations in China [31]: the governmental agencies (The Ministry of Education, PRC), an international non-profit organization (the World Wildlife Fund of China), and an international corporation body (British Petroleum, short for BP). The project was planned to be carried out in three phases over a 10-year period, from 1997 to 2007, which aims to realize the dissemination of ESD within the Chinese education system. To hit this target, many approaches have been taken, such as designing school-based curriculum (including primary and middle school), developing green school projects, promoting ESD in community, and conducting research on ESD in higher educational institutions [32].

Based on this, more and more ESD research and practical outcomes have become available in the past decade. For example, Li et al.'s [33] study demonstrated that the application of China Air Pollution Map on industrial pollution emissions could help restrain the industrial air pollution to a certain degree. Public participation and educational practices played an important role within this endeavor.

Garbage classification action is another very important initiative aimed at sustainable development. Findings indicated that people who paid more attention to environmental pollution, assessing more knowledge about garbage classification as well as living in a community with more supporting facilities to garbage classification, are more likely to take actions in garbage classification [34]. To support garbage classification for promoting city sustainable development, local governments across China have implemented what has been officially called 'Regulations on the management of domestic garbage' (i.e., [35,36]). Regulations stated that all schools are required to integrate the concept of garbage classification and green ecological development into the whole process of school education and teaching management, strengthening the work of garbage classification into the campus.

Hong Kong Special Administrative Regions also experience environmental challenges, such as the shortage of freshwater resources, pollution of seawater, and the noise pollution brought by the tourism industry [37,38]. Under the guidance of the China National Working Committee for UNESCO and the pressures from the rapid growing of Shenzhen, a charitable organization, the Hong Kong Education for Sustainable Development Association (HKESD), has been established since 2003. Six middle schools and one primary school were assigned as the ESD schools in Hong Kong ESD project [39]. UNESCO HK [40] conducted a quality evaluation of these schools in five aspects, namely school management, teaching and learning, moral education activities, school campus environment, and student all-roundedness, and suggested that student learning and innovation and teacher development need to be further improved in the ESD Experimental Schools. The report recommended that schools should encourage teachers' professional development in ESD and facilitate students to engage in sustainable development-related courses or programs [41].

According to the school environmental policies, schools in Hong Kong are encouraged to integrate environmental education into the curriculum. They also published the

Teacher Handbook proposing a primary school-based curriculum framework related to sustainable development.

Similar to Hong Kong, the Curricular Reform and Development Committee of the Education and Youth Affairs Bureau in Macao proclaimed curriculum guidelines for pre-primary to high school education, and environmental education was also added into the guidelines as an essential issue [42]. Contents in the syllabus are strongly related to environment in a more explicit way [43]. Animals, plants, and natural phenomena need to be included in the curricula of primary schools. The curricula for higher grades need to address environmental issues from a more global and common perspective and to make students aware of the importance of environmental pollution and sustainable development [44]. Moreover, the Environmental Information Centre established by the Civic and Municipal Affairs Bureau (CMAB) provided activities to all residents, such as using solid waste to make artworks and experience planting [45], Civil Education Information which aims to promote residents' consciousness of environmental protection. Environmental education relevant issues could also be found in pre-primary to secondary education in Law Number 9/2006 in Macao, for example, "To enhance the national consciousness, global horizon and awareness of environmental protection" [46]. These practices highlight the importance that Macau government attaches to ESD.

Based on our literature review, one can assume that ESD in China in general and Macau in particular is still mainly focused on classical environmental issues, but not yet, at least for the most part, on sustainability in a comprehensive way, including ecological, economic, and social perspectives. Additionally, little is known on the role of principals in ESD. A brief review of China's progress in the field of ESD during the five-year period (2015–2019) and suggestions for promoting ESD in China are reported by Wang and Shi [47]. Wang and Shi concluded that China has been adapting to the needs of the sustainable development of society and human beings and has provided workshops to school principals and teachers in order to promote quality education in school.

1.5. Sustainability and ESD as Leadership Responsibilities

The current insufficient structural anchoring of ESD in schools could be due to the fact that the aspect of leadership and the role of school management have still been given very little consideration [24,25]. Here, too, the WAP marks a turning point: in the Road Map, UNESCO identifies the heads of educational institutions as central target groups [9]. Again, ESD 2030 prolongs this focus [10].

With their actions, school principals exert a decisive influence on life and work, teaching and learning in a school. School effectiveness research, in particular, has produced a large amount of empirical evidence that underscores the significance of school management for the quality and performance of a school (cf., for example, [48,49]). The actions of the school management have an important effect on the teaching and school climate and on the self-image and motivation of teachers, and thus have an influence on the quality of teaching, education, or upbringing and thus ultimately also on the learning performance of the pupils [26,50].

The importance and role of school management in the implementation of sustainability and ESD in schools has rarely been the subject of empirical studies. The results of school effectiveness research, however, allow the conclusion to be drawn that school principals exert a significant influence here, too [23].

Research on ESD for the most part focuses on teaching and learning, whereas only a small number of studies have explored ESD implementation and how it relates to school organization [51]. Those who have investigated successful ESD implementation highlight the importance of the school leader [23]. The principal's importance is substantial in assisting teachers to develop ESD pedagogical strategies and establishing the school as an environmental agent within the community [52]. Mogren and Gericke even identify proactive leadership as a key aspect of implementation [53]. Other studies have shown that a principal's personal care and commitment to environmentalism and sustainable

development plays a large role in implementing ESD in school policy [54,55]. Other key factors identified as essential to an effective ESD program are distributive leadership and the active integration of involvement from other school staff and community [52,56,57]. A principal's lack of willingness to undergo a school transformation and a dearth of confidence in their own administrative skills are constraining factors of successful ESD implementation [52]. The growth of ESD is also limited by a shortage of time and space in the curriculum [58].

1.6. ESD and School Leadership in Germany, the USA, and Macau: Intermediate Results

Germany, with its long history of environmental education, adopted the concept of ESD early. During the ESD Decade, structures to foster ESD were developed and numerous projects were carried out. Additionally, the following UN programs guided many activities. The process and its progress are both monitored. ESD is integrated into many formal documents, but there are big differences between the states and individual schools. Still, ESD is not structurally anchored within schools, and school leadership for ESD is not yet within the focus of educational policies, practice, and research.

In the United States, several high-level initiatives sought to foster the development of ESD. Responding to the ESD Decade, programs were created to raise the awareness for ESD and to expand ESD in schools. The GAP accelerated progress towards ESD, but despite many activities, ESD is only just starting to develop in the United States. Monitoring ESD activities on national and state-level is sporadic. Little is known about the role of principals in ESD.

In mainland China and Macau, the environmental crisis led to more and more environmental policies, starting in the 21st century. ESD is considered an essential area in the new Chinese educational reform. The country answered to the UN Decade and the following programs with developing structures and with teaching and learning projects. Environmental issues are integrated into official documents. ESD is still focused on environmental issues and not yet on sustainability in a comprehensive way. The role of school leadership for ESD is not yet the focus.

2. Theoretical Background

This study utilized a three-way model of school development (Figure 1) by Hans-Günter Rolff [59–61]. According to this model, school development involves three components: instructional development, human resource development, and organizational development.

According to the paradigm of the individual school as the driving force of school development, it is up to the school, in which areas they start and where they want to run school development [61] (p. 19), which requires thinking in systemic relationships. In the final consequence, “every path of school development necessarily leads to the other two” [61] (p. 19). In other words, as Rolff put it, “no lesson development without organizational development and human resource development, no organizational development without HR development, no HR development without organizational development and lesson development” [61] (p. 21, translated by the authors).

Added to this is the extracurricular area, i.e., the school environment, as the school has many contacts with various stakeholders, other partners, and organizations or networks.

In terms of education for Sustainable Development, this could mean that a school can start to develop lessons, for example with the school type-specific implementation of the curriculum requirements. In the context of the system, however, the fields of HR development and organizational development are also affected, since the topic should, for example, find its way into the training concept for teachers and should involve team development and steering groups should be driven to act strategically. On the other hand, according to this understanding, it would also be legitimate to begin with the positioning within the school program, in order to follow the other “paths” successively and appropriately coordinated in the later process.

Figure 1. Three-Way Model for School Development; Source: Rolff 2016, p. 20, translated by the authors.

The three fields finally are connected or interwoven with each other and they are mutually dependent, and school management has a direct or indirect impact on all three of them. Against the background of this holistic view of school development, the study seeks to identify management strategies that principals use in order to implement, develop, and anchor ESD in their schools.

3. Methods

3.1. Participants

Four German principals from schools in the state of Baden-Württemberg, five US principals from schools in the state of North Carolina, and five principals from schools in Macau participated in this study. Based on the German sample (four principals), the interviews from the USA and Macau (five interviews each) are compared (Figure 2).

3.2. Procedures

Since this field of research is new and less developed, the study is based on a descriptive-explorative approach (Figure 2). Semi-structured expert interviews [62] with principals of various non-specialist school types were conducted in Germany, the United States, and Macau.

The four interview questions were:

1. In your school, do you have ESD activities/programs/curricula? If so, please describe them in detail.
2. How would you describe your role (role, tasks, strategies) in the process of ESD implementation?

3. From your perspective, what competencies must principals have in order to create/sustain ESD in their schools?
4. Has anything hindered or prevented you from creating/sustaining ESD activities/programs/curricula in your school? If so, what is it?

Figure 2. Qualitative Design (qualitative-explorative approach).

For the purpose of uniformity in collection of data and analysis, the German interview guide was translated and retranslated in both countries (USA and Macau). The questions allowed open-ended responses and were flexible enough for the interviewer to collect information on unexpected dimensions of the topics. In each country the same researcher conducted all the interviews. Each interview was audiotaped and transcribed verbatim.

The analysis was made using the qualitative content analysis according to Mayring [63–65] as well as a deductive-inductive category system (Figure 3).

Main categories	Sub categories
1. Structural anchoring of ESD <i>ESD activities/ programs/ curricula?</i>	e.g., – vision and mission statement – school program and concepts
2. Principal's job/tasks <i>Role and strategies in the process of ESD implementation?</i>	e.g., – roles – tasks within the fields of school development – strategies
3. Principal's competencies <i>Competencies in order to create/sustain ESD in their schools?</i>	e.g., – leadership skills in different areas – self-management – personal development
4. Obstacles during the implementation process <i>Hindering or preventing factors?</i>	e.g., – roles – tasks in the fields for School Development (model)

Figure 3. Category system.

The involved researchers from the three countries/regions worked with the same category system. Furthermore, they matched and discussed selected estimates and interpretations or questions by several virtual round table meetings. The presentation of the research results is—analogue to the methodological approach—descriptive and explorative with cross-case comparisons.

4. Findings

This section presents the findings of the study including significant quotations from participants.

4.1. Structural Anchoring of ESD (Activities/Programs/Curricula)

First of all, there is a big range in the ways to bring ESD to schools.

In this context, there is a remarkable difference between the countries in terms of the type and scope of central requirements. In the United States (“Nothing related to ESD is externally mandated. As a school, we look at ways that we can prepare students for the future” (USA_SP1, I. 13). In Macau, there are no requirements from the district, state, or federal government. In Germany, ESD is given high priority and is also addressed accordingly at the level of the Conference of Ministers of Education and Cultural Affairs (ministers and senators of the federal states). In addition, ESD is anchored in school curricula (for example, in Baden-Württemberg).

The German sample shows that aspects such as the school’s mission statement, school program, or a common vision are central elements at all four schools. In three schools the idea of sustainability is firmly embedded. One of the interviewed school principals considered a broad-based approach to be important. ESD should not be promoted by individual colleagues or in individual projects, but should be given an important place as early as possible in the overall context of school development (see GER_SP1, ll. 44 ff.). According to him, individual actions that are limited to certain subjects are actually rather obstructive in view of a holistic structural approach. Through the interviews it also became clear that the topic of ESD should be continually pursued (“The team simply should not stop working on it. It is good where we are right now but one should not rest on it; the wheel must keep on running” (see GER_SP2, l. 529 ff.)).

One of the principals emphasizes the necessity of “key points”, but at the same time the importance of “flexibility” (see GER_SP1, l. 284 ff.).

Although it is important to create structures, ESD means that it is not always possible to proceed according to a fixed pattern. Agile structures or a flexible approach to these structures is therefore needed. A principal illustrated this by the following example: “We have a learning studio and if a project group comes up, they can use it. That may be, after two years the project group is gone, but then another one comes along” (GER_SP1, l. 262 ff.).

In two interviews, the intentional linking of the school curriculum with sustainability issues was pointed out. One school principal even mentioned a separate ESD curriculum. Even though the other schools did not have a curriculum of this kind, the link between ESD and teaching was clear. One principal reported on a motto (“We are doing education for sustainable development here. So make sure that you implement this in all your subjects” (GER_SP2, l. 288 f.). One principal, in turn, linked the implementation to the concept of differentiation, in which pupils could choose additional courses once a week, depending on their interests and preferences, also in the field of ESD.

A further aspect is the question of where ESD should be positioned alongside the mission statement and curricula. A separate steering group can help to promote ESD (see GER_SP3). At another school, it was even possible to create a more highly remunerated position for ESD (representative for sustainability with appropriate competencies).

At another school, teachers were given extra hours off work to implement or supervise relevant topics or projects (“For example, those responsible for the UNESCO school”, GER_SP1, l. 73f.).

In two interviews, it was reported that the environment of the school grounds (e.g., the forest) is actively integrated into the lessons (cf. GER_SP2, line 56; GER_SP4, line 497f.). At one school there was even a farm and a garden where various nature-oriented projects were carried out (GER_SP2, Z. 78ff.). Likewise, at another school, a school pond was included (GER_SP3, l. 268).

4.2. Principal's Job (Role, Tasks, and Strategies in the Process of ESD Implementation)

A broad view of people's system competence as well as systematic instructional development in this context (having a holistic view of instruction) can be seen as strategies (and at the same time as important competences). One principal mentioned the term "helicopter view" (GER_SP4, l. 577). For these two school principals, the global view was crucial. Just as sustainable development generally requires a global view, so does the management of a school need a view from a meta-level. Principal 1 explained this: "When I think in ESD categories, I have to manage the world in my school. So [...] I shouldn't come here and say I'm going to do my school the way I think I should. I have to see how the world is, what the world needs and then I have to manage this world" (GER_SP1, l. 607 ff.).

When organizing a school, it is important to open your mind to the world around you, according to one school director: "Because opening up is the basic concept. Opening up the locked school system to life and the issues of sustainability, etc. will automatically arise" (GER_SP4, l. 472 ff.).

Thus, it can be understood that principals need a view of the entire global world. School education as such has the task of preparing students for life in this world. The question of what the world needs must therefore be kept in mind and brought into the school organization. At this point a further look at the system is important: the school as a whole should pursue the guiding principles of sustainable development. In addition to system competence, "...there is also a need for the will to shape, i.e., this shaping competence..." (GER_SP1, l. 604 f.). On the one hand, a school must be designed on a collaborative basis, but on the other hand, it must also be well organized.

In this context, human resources development also plays a major role. "Principals must understand the difference between leadership and management" (USA_SP5, l. 19). In the interviews it became clear that not only teachers, but also students, parents, and the school board as well as external cooperation partners were involved in this area and that much active cooperation and collaboration was required. A U.S. principal stated, "We have a group now, students, teachers, and parents in equal numbers, who meet regularly to develop ideas and put forward ESD projects". Other stakeholders were also named, such as the school authorities, the city and community the school is situated in, and companies and non-profit organizations that can help with their expertise or sometimes with financial support. Ultimately, the entire school community and its environment must be part of the process, which entails a great deal of communication effort from the principals.

For example, participation opportunities would have to be created for the teaching staff, and their initiatives in the area of ESD would have to be bundled in a useful and practical way. One principal, for example, says that they do most things together rather than being dictated by her as principal (see GER_SP2, p. 94 ff.). She also refers to a cooperative management style and states that colleagues are allowed to express and implement their ideas. This eventually leads to high job satisfaction (see *ibid.* l. 117 ff.). One U.S. principal also expressed her exemplary function as a leader in conjunction with a visionary power: "Principals must be visionary and be able to establish or defend why they are taking the actions that they are taking" (USA_SP5, l. 18). In summary, and in reference to the primary goal, the following statement by a school principal would appear to be the most important: "The willingness to cooperate is very important; ESD does not work on its own" (GER_SP1, l. 606 f.).

4.3. Principals' Competencies

School leaders need several competencies to create sustainable ESD in their schools. Although the answers vary on this point, some competencies seem to be particularly important.

School principals need to have sufficient professional and background knowledge regarding the topic of ESD: "They need to be equipped with the knowledge of school management and curriculum as well" (MAC_SP5, l. 20f.). Only then they will be able to monitor it systematically in change processes. In this context, certain competencies

emerge that might easily be assigned to the topic of change management, combined with a high level of shaping competence. This was also illustrated by the following quote, which named competences that are necessary for school leaders to implement ESD: “The drive of school leaders and the vision and mind of school leaders” (MAC_SP2, l. 10f.).

A German principal said in this context: “I need the skills that I need as a principal, regardless of whether I introduce staff feedback or whether I want to anchor the topic of sustainability more firmly in the structure [or whether] I am working on quality development in the classroom. Which means: How do I lead colleagues in terms of personnel? What structural processes do I control? How do I take colleagues along during these processes? How do I create sustainability?” (GER_SP3, p. 63 ff.)

Skills in the area of strategic management as well as strategic and systemic thinking, a corresponding mindset, an open, broad view, and also a vision or a future image of one’s own school, in particular with regard to the topic of ESD, are to be mentioned here first and foremost. For example, one of the American school leaders named strategic thinking and growth mindset, along with the knowledge of ESD, as necessary competencies that a school leader needs (USA_SP1, l. 10ff.).

Furthermore, great communication skills and the ability to address the various target and stakeholder groups and to involve them in the topic in a targeted manner were mentioned.

It is not only a question of skills: several principals noted that the right attitude towards sustainability is pivotal. One U.S. principal mentioned: “Principals need to be educated on the importance of ESD so that they are willing to support adding these curricula to their school’s programming” (USA_SP3, l. 17f.).

4.4. Obstacles during the Implementation Process (Hindering or Preventing Factors)

In addition to “classic” reasons such as time factor or lack of resources or support, the school principals mentioned various obstacles that can hinder the introduction of ESD. In this context, “self-satisfied” and, so to speak, change resistant working groups were mentioned, having an attitude that is inconsistent with the topic of sustainability (GER_SP2). As a result, typical resistance can be encountered in this situation, as the following example quote shows: “You always run into a wall when you tackle cross-cutting issues [...] and feel like someone who is constantly breaking up concrete” (GER_SP4, l. 356ff.). All this can be very energy-consuming and possibly frustrating. He also sees the system based on school subjects as an obstacle, as it makes it more difficult to take a holistic view of the topic “sustainability”.

In addition, the requirements and obligations of higher authorities were repeatedly criticized, as they often complicate the realization of an ESD project. At this point, cutbacks in resources were mentioned, as well as the bureaucracy within the school system itself:

“I think that many principals, if they had talked to them, would have started talking about the issue differently: We don’t have time, we don’t have resources, we don’t have teachers. We have got enough to do and now this, on top” (GER_SP1, l. 710ff.).

And from the principals’ point of view, bureaucracy occasionally seems to take away from the purpose of school, and, moreover, it detracts from central issues such as ESD. It is also not easy to achieve a real impact in the actual implementation of projects, as pointed out by another school principal (GER_SP3). Finally, different ideas about the topic amongst the teaching staff are reported (GER_SP2), which has an obstructive effect on the understanding of a “common line”.

In Germany, the limited authority of the school and the principal seems to be a major hindering factor.

In the United States, however, a lack of resources and time is perceived as an obstacle to the successful implementation of ESD in schools. In line with similar obstacles such as insufficient resources and manpower, it is an issue in Macau that the awareness of ESD is not yet present to the desired extent. A Macau principal stated, “Parents and the society as a whole lack an understanding of sustainability education. We need their support, but

some parents do not understand how sustainability education might be useful.” Another remarked, “School authorities and government do not pay enough attention on ESD.”

5. Discussion

This study is limited in its methodology due to convenience sampling and self-reported data. Convenience sampling was used by the authors because the authors had access to the principals in their own cities. Therefore, these participants do not represent all principals in the countries/regions. Second, the data were from interviews with school principals and therefore were self-reported. Readers should be cautious in interpreting the results based on self-reported data because they reflect the perspectives of the participants instead of facts. However, the methodology also has advantages. It not only provided rich data through interviews but also allowed school principals to express their own opinions, which is the purpose of this study. The data allowed us to understand school principals’ perspectives of successful implementation of ESD in schools. Although a survey design could provide a much larger sample, the data would also be self-reported and would depend on the response rate. As principals are all busy, we were not optimistic of the return rate.

As was to be expected, according to the results of school effectiveness research [50] and previous studies on school leadership for ESD [52], our results support the assumption that principals play a significant role within the process of implementing ESD in schools.

From the viewpoint of the participating principals, classic leadership and management issues must be considered when introducing ESD if it is to be successful. Successful implementation of ESD in schools involves far-reaching change processes at all fields, which affect all school stakeholders. In line with previous research [55], our findings underscore the importance of actively involving teachers and other staff as well as parents and the community. ESD is a team task. Principals are important as initiators and facilitators of the process, but they need support on all levels. Accordingly, instructional development, personnel, and organizational development have to be considered. In German schools, the structural anchoring of ESD within the school organization is usually reflected in the mission statement. This is of great importance due to the common development, which ultimately also includes its actual implementation in everyday life. In the area of teaching, the structural anchoring can be seen within the school curriculum. This includes special projects and school clubs as well as a school profile in ESD. This leads to the conclusion that ESD should always be an independent process that focuses on the specific conditions at each individual school and the resources available to them.

School leaders need a variety of competencies for the endeavor of developing ESD in their schools, especially those in the area of human resource development and—from a more global perspective—in the area of change management. The school management plays the role of a change agent, and in this context, it is also important to break up more or less “rigid” structures in order to enable change. Accordingly, all aspects of change management and the strategies behind them must be taken into account. However, these can vary—depending on the individual school—so that individual approaches of schools and solutions should be considered by the school management. A systemic view of both the ESD issue itself and the school helps to create and sustain the best possible balance and coherence.

Our results reveal one aspect that has rarely be named in previous studies: the role of self-management. Introducing ESD in schools is a marathon, not a sprint. Several principals pointed out that self-management is required to maintain one’s own resources during this long-term process. From the answers to the question about obstacles and from the analysis of further detailed questions, the following factors can be deduced that significantly support a successful introduction of ESD at school. In order to be able to lead an organization successfully, it is also necessary to lead yourself. This is addressed in different ways in the interviews. In particular, ESD is very much associated with an attitude of the principals. Even if terms such as attitude or values are rarely used in the

interviews, implicit statements suggest that they are important. One's own personal beliefs in shaping sustainable development and thus the organization of school processes from the point of view of sustainability have a significant influence on the actions of the principals. In addition, aspects of time management, work-life balance, and personal development are also addressed, which in turn underline the need for a sustainable approach to one's own resources. All in all, this can be subsumed under the overall concept of self-management.

Regarding a comparison between the Germany, the United States, and Macau, our samples were too small to allow for far reaching conclusions. However, some cautious assumptions on similarities and differences may be drawn from our results. In all three countries we found a very broad range of the extent to which ESD is already integrated in schools and the level of commitment towards ESD the principals show. In all three countries, principals seem to play an important role. They also refer to similar management strategies for implementing ESD.

Germany, the United States, and Macau differ considerably with regard to the degree to which UN Programs are taken up and broken down to according national and statewide policies. There is no direct linkage between such policies and the effective implementation of ESD, but several principals referred to these policies (or their absence) as a supporting (or hindering) factor.

Future studies might pick up these assumptions and try to confirm or refute them with more detailed data. Additionally, future research should work out in more detail how principals in Germany, the United States, and Macau might be supported in their efforts to introduce and foster ESD in their schools.

6. Conclusions

With the guiding principle of sustainable development, we want to lead the way for a sustainable life in this world. The three dimensions of economic, ecological, and social development are central to an understanding of sustainable development, together with the 17 SDGs, to which Germany, the United States, and Macau have also committed themselves. Education is seen as a main aspect in confronting society with the guiding principles of sustainable development. Thus, the educational environment of schools moves into the center of attention. Due to their responsible position, school principals are important players for anchoring ESD in schools.

The principals mentioned a broad variety of competencies, such as the need to be visionary, to be practitioners, or to have knowledge of ESD themselves in order to introduce ESD.

As change agents and system thinkers, principals play a pivotal role in the introduction of ESD in schools. In order to be able to assume this role and the responsibility that goes with it, they must have several competencies and receive comprehensive support. The special support depends on the situation in their schools combined with the level of competencies. In the overall view, realizing these two issues can make a decisive contribution to steering the ship towards a good future.

Author Contributions: Conceptualization, U.M. and T.S.; methodology, T.S.; project administration, U.M.; investigation, U.M., D.R.H., C.W. and T.S.; resources, U.M., D.R.H., C.W. and T.S.; data curation, D.R.H., C.W. and T.S.; writing—original draft, U.M. and T.S.; writing—review and editing, U.M., D.R.H., C.W. and T.S.; visualization, T.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: UNC Charlotte IRB Protocol #17-0452 (dated 10/12/18).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data cannot be shared since the participants of the study did not agree on the publication of the interviews.

Conflicts of Interest: The authors declare no conflict of interest.

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