

## Article

# What Teachers Think and Know about Education for Sustainable Development and How They Implement it in Class

Eva-Maria Waltner <sup>1,\*</sup>, Katja Scharenberg <sup>2</sup>, Christian Hörsch <sup>1</sup> and Werner Rieß <sup>1</sup>

<sup>1</sup> Department of Biology and Pedagogy of Biology, University of Education Freiburg, Kunzenweg 21, 79117 Freiburg, Germany; hoersch@ph-freiburg.de (C.H.); riess@ph-freiburg.de (W.R.)

<sup>2</sup> Department of Sociology, University of Education Freiburg, Kunzenweg 21, 79117 Freiburg, Germany; katja.scharenberg@ph-freiburg.de

\* Correspondence: eva-maria.waltner@ph-freiburg.de; Tel.: +49-(0)761-682-903

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**Abstract:** After the end of the first *Global Action Programme on Education for Sustainable Development*, coinciding with ongoing international evaluation processes, questions about the implementation of the Education for Sustainable Development programs and assessments continue to be raised. The present study examined Education for Sustainable Development implementation at the local (teachers') level, assessing what teachers think and know about Education for Sustainable Development and how they implement it in secondary school classes in Baden-Wuerttemberg, Germany. By providing novel data from a teacher survey in 2019, this study revealed that Education for Sustainable Development in some aspects still lacks concrete structural implementation in educational contexts. Using a longitudinal approach, we additionally compared data from an earlier representative assessment in 2007 to the data from 2019. In reference to the preceding evaluation report, the present study showed, for example, that teachers' attitudes towards Sustainable Development Goals were significantly higher in 2019 compared to 2007. This study provides clarification of the needs and achievements of the Education for Sustainable Development implementation process. In sum, our analysis found that from the teachers' perspective, more abstract policies are not needed, but instead teachers ask for very concrete support that is close to teaching and the schools' objectives. The results of our study help, in a larger sense, to navigate society towards a more sustainable direction and towards achieving the Sustainable Development Goals by highlighting the remaining challenges of these broad objectives.

**Keywords:** Education for Sustainable Development (ESD); UN Decade of Education for Sustainable Development (UN DESD); Global Action Programme on Education for Sustainable Development (GAP); schools; street-level; implementation; teachers; Sustainable Development Goals (SDGs); educational policy; environmental education

## 1. Introduction

In 2002, the United Nations (UN) proclaimed the years 2005–2014 as the *World Decade of Education for Sustainable Development* (UN DESD) [1]. This initiative was one of the numerous international policy measures targeting Education for Sustainable Development (ESD). In this decade, the UN called upon all states to implement and integrate the principles of sustainable development (SD) in all educational institutions. As Tilbury and Janousek stated: In “the final assessment, the Decade will be deemed successful if it has served to: (a) improve practices of current practitioners in ESD; (b) influence and develop policy frameworks for ESD and (c) reach out to stakeholders who are yet to see how ESD is relevant to their interest” ([2], p. 138). After the UN DESD ended, the first *Global Action Programme (GAP) on Education for Sustainable Development (ESD)* was launched. To enable a strategic focus and foster

stakeholders' commitment, the GAP identified five priority action areas to advance ESD. Augmenting the capacities of educators and trainers to more effectively deliver ESD constituted one of these priority action areas (see [3], p. 15). Hence, educators are perceived as being powerful agents of change for delivering the educational response to sustainable development (see, e.g., [3], p. 20 and [4], p. 51).

The present study focused on the implementation process on the ground and assessed the teachers who are one of the most important actors of teaching ESD at schools. This investigation mainly focused on assessing the knowledge of the relevant terms and materials connected to ESD among teachers. Furthermore, we empirically recorded the occurrence and frequency of ESD-related topics taught in class. These investigations were conducted in the German federal state of Baden-Wuerttemberg (BW) as an example because the state recently selected ESD as one of six new guiding principles for the school curriculum inaugurated in 2016. However, until now, no empirical data has been published on the impact and implementation process of the new ESD guiding principle in BW. For this reason, the following article focuses on closing this gap by providing the information needed to analyze the current state of ESD on the ground at the classroom level from the teachers' perspective. The findings of this study could also be used to draw some parallels to other ESD implementation processes.

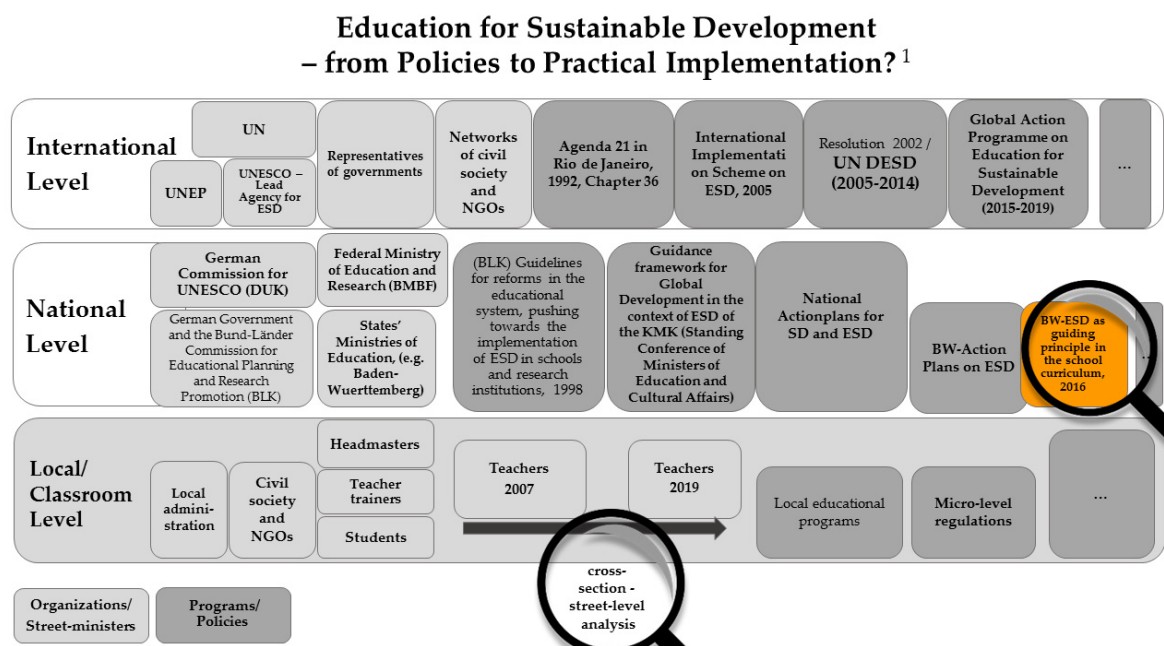
Section 2.1 provides a short overview of the important ESD-related policies from the local to the international level, and Section 2.2 gives a brief overview of how the authors conceptualized ESD in schools. Section 3 describes the method, the questionnaire, and our data collection procedure. Section 4 contains the findings from the descriptive and inferential statistics for the teachers' sample from 2019 and compares them to the sample in 2007. Section 5 discusses the main findings of the study. Section 6 provides a brief excursus into implementation theory, possible future research paths and measures.

## 2. Theoretical Foundation of the Study

### 2.1. ESD—from Policies to Practical Implementation?

The essential role of education is widely accepted and is considered crucial by policy makers. The realization of sustainable development (SD)—and ESD along with it—has become a great challenge for society. Consequently, it has become a highly politicized topic. Much political action has been taken since the beginning of the discussion about SD and ESD [5–7]. Political leaders have announced to take ESD actions on international, national and local levels. However, the critical question remains as to how these policies reach the targeted level. Figure 1 displays a non-exhaustive list of ESD policy documents and stakeholders on international [1,3,7–9], national [10–12], and local levels [13–15]. The pictogram shows the implementation process of ESD as a simplified cascade process, which makes it hard to estimate all the direct and indirect effects occurring at different levels, e.g., intermediate levels that first translate the international policies to national programs before they are further transmitted into local programs. The upper level displays international policies such as the UN Resolution from 2002 opening the floor for the UN DESD and the GAP for ESD.

For ESD policies to have the desired effect, the stakeholders who implement the policy or the policy targets at the classroom level (i.e., teachers) need to be a major focus of empirical work in this field. The magnifiers in the figure mark the level of analysis for the present study. The teachers are particularly important for carrying out a consistent implementation process in educational practice, i.e., at the school or classroom level.



**Figure 1.** Simplified Implementation Pictogram of the International to Local Policies and Stakeholders.

<sup>1</sup> non-exhaustive list of stakeholders and programs in ESD.

## 2.2. Conceptualization of ESD, Current State of Research and Research Questions

In our research group, we use the term ESD in the school context describe all actions by which people seek to promote learners' sustainability competencies, i.e., enabling them to shape a SD (see, [16,17]). With this definition of ESD, the authors aim to acknowledge the openness of the ESD concept that is needed to ensure the possibility of adaptation with regard to, e.g., an uncertain future or societal changes. With this approach, we also intend to promote the need for concretization and operationalization of sustainability competencies to promote empirical work on possible effects of ESD in schools. An important goal of teachers is to promote their students' sustainability competencies. They are the change agents—or in Lipsky's words, "street ministers of education" ([18], p. 12)—that pursue this goal. Consequently, teacher characteristics (e.g., curriculum knowledge and motivation) and practices (e.g., self-reported use of ESD in the classroom, use of materials) were the special focus of this study. In 2007, the Ministry of Education, Youth and Sports and the Ministry of Environment, Climate Protection, and the Energy Sector commissioned an evaluation study to assess the current state of ESD in BW secondary schools. The main goal of the teachers' survey was to identify the state of implementation of ESD-relevant content and factors that foster or hinder its implementation at the classroom level. A key finding was that teachers who had taught ESD-relevant content had higher scores in: (1) self-reported SD attitudes, (2) self-reported general knowledge about ESD concepts, (3) perceived threat of environmental challenges, and (4) their knowledge about ESD teaching materials compared to teachers who had not taught ESD-relevant content [19]. A similar study in 2015 was conducted to evaluate the current state of ESD implementation at the end of the UN DESD in BW [20] and on the national level [21]. The present study aims at advancing the findings from these two previous studies by answering the following two research questions:

**Research Question 1:** What is the current state of teaching ESD reported by teachers in Germany (Baden-Wuerttemberg) after the implementation of ESD as a new guiding principle?

**Research Question 2:** How have teacher characteristics (e.g., ESD-related curriculum knowledge, motivation, attitudes towards ESD) evolved over the past twelve years?

### 3. Method

#### 3.1. Sample

The classical approach of street-level research clearly focuses on qualitative studies to conduct street-level research [22]. However, quantitative data in this article was collected to examine teachers' assumptions in the ESD context. For the data collection process in 2019, we chose a slightly different approach than in the year 2007. The teachers' survey in the more recent project was imbedded in a larger study focusing on a multi-level analysis of potential factors influencing students' sustainability competencies [16]. Hence the teachers we asked to participate in the 2019 survey taught the students surveyed in the framework of the larger research project. We randomly selected 10 secondary schools in BW from a list containing all schools accredited by the state. The different school tracks were chosen according to the frequencies of school tracks represented in BW. To respect teachers' scarce time resources, we decided not to survey of all subject teachers. Instead, we formed clusters of teachers based on the classical sciences, social sciences, and humanities disciplines and surveyed only teachers who were representative of these disciplines with the most numerous ESD links according to a school curriculum analysis. This sampling method resulted in a total of  $n = 113$  teachers who participated in the online survey in 2019. The respondents' age ranged from 27–65 years with an average age of 41.0 years, and the overrepresentation of women (61.9%) was consistent with the general trend in BW [23]. The average teaching experience was 12.9 years. In the long-term, in our cross-sectional analysis that answer Research Question 2, the 2019 sample was compared to a larger representative sample ( $n = 1102$ ) of teachers in BW from 2007 who taught the same subjects. In 2007, the gender ratio was more equally distributed (53.4% females, 46.6% males). The teaching experience (17.9 years) was on average 5 years higher than in the 2019 sample, which corresponds to the higher average age of 44.9 years for the 2007 sample. This comparison allowed conclusions about the progress of ESD on the micro level, i.e., school progress within the 12-year period from 2007–2019.

#### 3.2. Questionnaire and Data Collection Process

The items we used to assess teacher characteristics such as knowledge about ESD (whether the teachers had already heard of ESD) or SD (and policy) programs, attitudes, and practices related to ESD largely stemmed from the 2007 study [19]. Even though the scale of the survey group for 2019 was downsized, comparison of the two data sets was possible because the data from both studies were obtained from a random sample that was representative of the schools in BW. Therefore, comparing the results offers suitable indicators to draw conclusions on the development of ESD in schools in BW, and the comparison also allows for conclusions about the progress of the ESD implementation process within the past 12 years.

We administered the 2019 data collection with an online survey using the software package Unipark (questback). The survey comprised 26 questions with dichotomous (yes/no), Likert-scaled, and open-ended questions. We added two ranking items in the 2019 survey based on a model of the national ESD monitoring survey. Teachers were asked to rank the relevance of ESD compared to other societal and educational cross-sectional issues. The complete online survey was conducted in German. The survey is available in the original language in the Supplementary Materials Section S1. The survey questions were clustered as follows:

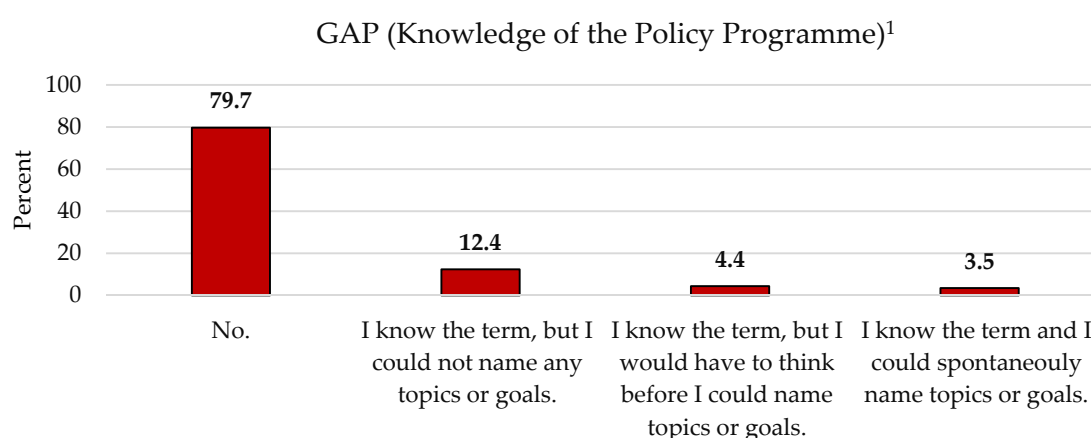
- Demographics: school track, subject specification, gender, age, teaching experience, teachers' attitude towards environmental protection and SD (questions 1–5)
- Knowledge of ESD, programs, and materials (questions 6–13)
- ESD practices in the classroom (question 14 and an option to provide the ESD topics taught)
- Structural hindering and fostering factors in school (e.g., teachers' attitude towards ESD), ESD materials, and external/internal cooperation (questions 15–26)

The Ministry of Education, Youth and Sports Baden-Wuerttemberg, the Ministry of Environment, Climate Protection and the Energy Sector Baden-Wuerttemberg and the Foundation for Environmental Protection (Stiftung Naturschutzfonds) approved the final version of the survey. The survey was first sent to the schools' principals (because of data protection reasons) and then the online link to the survey was sent to the teachers.

## 4. Results

### 4.1. Descriptive Statistics of the Sample in 2019

We assessed the teachers' estimation of the core terms of SD, ESD and the ESD policy programs. We considered these factors as important determinants of the current state of the ESD implementation. The most important findings in connection with these terms are presented in Figure 2.



**Figure 2.** Knowledge of the Global Action Programme on Education for Sustainable Development in 2019. <sup>1</sup> English translation from the German original: The Global Action Programme (GAP) was launched as a follow-up to the UN Decade of Education for Sustainable Development (ESD). Have you already heard of it?

Teachers were asked to indicate their knowledge about GAP as an indication of their knowledge about ESD policy programs. The results are displayed in Figure 2. Only about 8% (3.5% with thorough knowledge and 4.4% with basic knowledge) of the teachers knew about the international policy program for ESD (GAP for ESD).

These results need to be considered in the broader perspective of what kinds of policies are relevant or accessible for teachers. Table 1 shows a decreasing trend of importance of the listed policy programs from the local to the international programs.

**Table 1.** Mean Scores for Relevance of the National and International Policy Programs Influencing the Teachers' Decision to Work on ESD-Relevant Topics in Class.

Policy Program	New Curriculum in BW	ESD as Guiding Principle	Sustainability Strategy of the State of BW (local)	German Sustainability Strategy (National)	UNESCO-WAP for ESD
Mean score <sup>1</sup>	2.36	2.27	1.91	1.88	1.64
(standard deviation)	(0.87)	(0.90)	(0.86)	(0.83)	(0.72)
n = number of cases	n = 113	n = 113	n = 113	n = 112	n = 111

<sup>1</sup> Assessed on a four-point Likert scale ranging from 1 = not important to 4 = very important. Teachers were asked to evaluate the relevance of the different local, national, and international policy programs with reference to their decision to teach ESD-relevant topics.



The new curriculum in BW, which represents the most local educational policy program apart from the school policies, had the highest mean score. About 46% of teachers indicated that the curriculum played an *important* role in their decision to teach ESD, and only 4.4% indicated that they found the new curriculum to be *very important*. The other half of the teachers stated that the curriculum was *less important* or *not important* for their decision to teach ESD-relevant topics.

Before elaborating on ESD policies, we also asked the teachers about their general knowledge of the terms connected to ESD. When asked whether the teachers knew the term SD, 92.9% answered that they could spontaneously or after a bit of reflection name topics connected to SD. Still, 7.1% of the teachers indicated they had no knowledge about the SD term, even though it is closely related to the guiding principle of ESD in the school curriculum.

We therefore considered it relevant to look at both the fostering and hindering factors for working on ESD-relevant topics in class. When asked about the needed support, the teachers in 2019 indicated a high demand for concrete ESD materials (67.3%), more links to extracurricular partnership learning facilities (51.3%), and more information on ESD (49.6%).

Among the five most hindering factors that prevent teachers from integrating sustainability issues in class, teachers indicated a lack of training (49.6%), teaching materials (47.8%), and knowledge on how to implement ESD in class (46.9%). Teachers also responded that they fear to neglect other subjects or topics if they implemented ESD (45.1%), and they indicated that teaching different subjects instead of an interdisciplinary approach (38.9%) hinders the integration of sustainability issues. Furthermore, 38.1% of the teachers responded that ESD was not sufficiently anchored in teaching and educational plans, which they considered as a hindering factor. Almost one fourth of the sample (23.9%) reported that ESD was too complex for school lessons and that a lack of support from colleagues (13.3%) or a lack of support from school principals (7.1%) hindered them from teaching ESD topics, and 7.1% of teachers believed that incorporating ESD-relevant topics in their school lessons was not part of their job.

#### 4.2. Development of the Teachers' Characteristics, Attitude and Teaching Practice within the Past 12 Years

To analyze the progress of ESD implementation, we compared the current state of implementation from the 2019 survey to the findings from the 2007 study, equally conducted in BW secondary schools. As displayed in Figure 3, the percentage of teachers who had already heard of the ESD term increased by 36.1 percentage points from 2007 (31.2%) to 2019 (67.3%). Despite this increasing trend, 32.7% of teachers in 2019 still had not yet heard of ESD in the school context. This high percentage is especially striking given that the new school curriculum implemented ESD as a guiding principle in 2016.

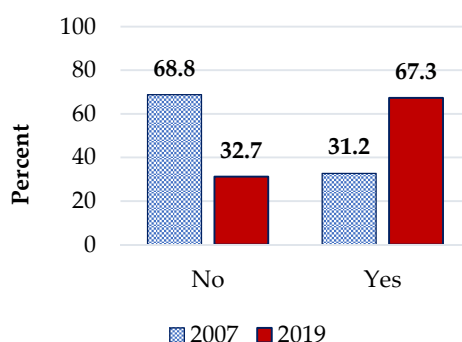


Figure 3. Knowledge of the Term ESD in 2007 [19] and in 2019.

We then compared the frequency of ESD-related subjects taught in class in 2007 and 2019. The results of the opening question on ESD teaching practices are displayed in Figure 4. Before the teachers were asked to indicate whether or not they had taught ESD-related topics, they were given a list of possible ESD-related topics (see Appendix A). The topics were clustered in the following four

thematic blocks: ecological, economical, socio-cultural, and overlapping ESD subjects. The results that the percentage of ESD topics taught in class was higher than the percentage of teachers who know the term ESD (see Figure 3) are not surprising. Having the list of topics, even if they did not know the terms SD, ESD and the UN DESD/WAP (i.e., the concepts or policy documents), they could still identify with the content. This observation is in line with previous findings [19]. Teachers were not able to identify with the terms, but they already integrated ESD topics in their teaching practice.

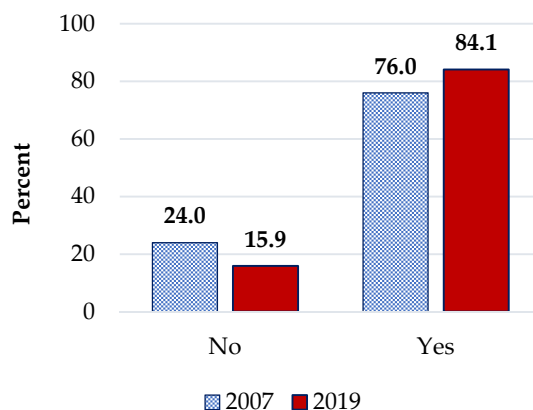


Figure 4. ESD Topics Taught in 2007 [19] and in 2019.

Figure 4 shows that a minor increase of 8.1 percentage points of ESD topics taught in class occurred over the past 12 years. As suggested by political theory, implementers (i.e., teachers in our study) are interested in processing work consistent with their own preferences [18]. Our findings suggest that teachers who have a high environmental awareness and a high score in the perceived threat of environmental challenges, have a personal interest in teaching ESD-related subjects and might therefore positively contribute to ESD implementation as it was shown in earlier studies [19]. Consequently, they are critical disseminators in the successful implementation of ESD in schools. Hence, the development of the teachers' convictions concerning sustainable development and environmental awareness were already determined (Table 2).

Table 2. Mean scores of SD attitudes in 2007 and 2019.

Items Measuring Teachers' Attitudes towards Environmental Protection and Sustainable Development/Sustainability <sup>1</sup>	M (SD) n	
	2007	2019
I am worried or outraged when I think of the environmental challenges our children and grandchildren might have to face.	3.75 (1.02) 1097	4.04 (1.04) 113
There should be fair trade between the rich and the poorer countries of the world.	4.61 (0.64) 1098	4.72 (0.51) 113
When I read about environmental problems or watch them on television, I am worried or outraged.	3.85 (0.94) 1094	4.02 (0.83) 113
I think that politicians still do far too little for environmental protection.	4.11 (0.88) 1095	4.35 (0.75) 113

Table 2. Cont.

There are limits to growth that our industrialized world has already passed or will pass very soon.	4.11 (0.89) 1093	4.35 (0.81) 113
We should not consume more resource than can regrow.	4.64 (0.62) 1097	4.65 (0.60) 113
There should be more equity between the generations. We should not exploit the environment at the expense of future generations.	4.69 (0.57) 1097	4.65 (0.53) 113
If we continue with our “business as usual”, we are heading towards an environmental disaster.	4.14 (0.88) 1096	4.31 (0.77) 113
Science and technology will solve many environmental problems without having to change our way of life.*2	2.43 (0.91) 1094	2.35 (0.96) 113
In my opinion, environmental problems are strongly exaggerated by many environmentalists.*2	2.05 (0.92) 1093	1.98 (0.94) 113
Scale mean value (SD) for teachers’ environmental protection and sustainable development (Cronbach’s $\alpha = 0.82$ )	4.08 (0.54) 1099	4.23 (0.54) 113

<sup>1</sup> Items measured using a 5-point Likert scale: (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree). <sup>\*2</sup> Reverse-scored items.

A comparison of the mean scale values shows the outstanding result: Teachers participating in the 2019 survey had a significantly more positive attitude towards environmental protection and sustainable development,  $t(1210) = 2.84$ ,  $p = 0.005$ . According to Cohen (1988), this difference could be interpreted as a small effect ( $d = 0.28$ ). However, when looking at Table 3 and the mean scores of teachers’ assessments of ESD importance, another picture arises.

Table 3. Mean scores for teachers’ assessments of the importance of ESD in 2007 and 2019.

Items Measuring Teachers’ Assessments of the Importance of ESD at Their School <sup>1</sup>	M (SD) n	
	2007	2019
ESD topics are important at our school.	2.64 (0.82) 1044	2.64 (0.82) 111
The headmasters support ESD-related teaching projects at our school.	2.35 (0.91) 1008	2.80 (0.87) 111
Only a few colleagues at our school deal with/tackle education for sustainable development. *2	2.35 (0.83) 1018	2.34 (0.79) 112
Issues of sustainable development play a rather subordinate role at our school. *2	2.01 (0.90) 1022	2.06 (0.83) 111
Scale mean value for teachers’ assessments of the importance of ESD (Cronbach’s $\alpha = 0.79$ )	2.74 (0.68) 1063	2.76 (0.66) 113

<sup>1</sup> Items translated from the German questionnaire version. Measured using a 4-point Likert scale: (1 = strongly disagree, 2 = partly agree, 3 = largely agree, 4 = strongly agree). <sup>\*2</sup> Inverted items.



As can be seen in Table 3, no change in teachers' responses occurred in ESD importance at their schools over the last 12 years. Additionally, teachers indicated the extent that they agreed they would teach SD content even if they associated it with increased effort. Teachers in the 2019 sample signaled a significantly higher willingness to teach ESD topics even if it was associated with higher efforts than the teachers in the 2007 sample ( $t(139.171) = -3.22, p = 0.002$ ). Teachers were also asked how they assessed the impact of ESD on students' sustainability behavior on a 4-point Likert scale (1 = disagree to 4 = strongly agree). Teachers in 2019 ( $M = 2.94, SD = 0.78$ ) agreed with this statement to a significantly higher extent than teachers from the 2007 sample ( $M = 2.69, SD = 0.81; t(140.100) = -3.23, p = 0.002$ ).

## 5. Discussion of the Main Findings

The following main findings regarding the current state of teachers' competencies for ESD can be summarized regarding RQ 1: Teachers in the 2019 sample indicated that they were familiar with the concepts of SD and ESD in school. They had a high level of sustainability awareness indicated by their mean score of attitudes towards environmental protection and SD, which was significantly higher compared to the sample in 2007. However, it should be noted that the indicated knowledge about higher-level or international policy programs was rather weak. In connection with this lack of knowledge, the teachers also ascribed hardly any significance or relevance to the international policies for their own teaching. Within the framework of ESD policies, the local policies had the highest ranking amongst the teachers. However, still half of the teachers (49.5%) indicated that the new curriculum was of little or no importance for their decision to teach ESD or not. This finding is especially striking given the new guiding principle of ESD that has been implemented in the BW school curricular and, from our perspective, has been and continues to be an important educational program. We conclude from our findings that the (ESD) goals, proposals, demands, and recommendations in the policy programs fail to easily reach the teachers. They are either not perceived or not accepted by teachers, which hinders their direct implementation. Even if they are transferred by education policy, ministerial staff, and administrative officials in the form of curricular guidelines and are intended to be binding in the classroom, teachers might not perceive them as relevant for their teaching practice. Our findings also suggest a more pragmatic, bottom-up approach parallel to the existing top-down approaches. We elaborate this point in Section 6.

With the two following recapped questions, we want to highlight again the importance of integrating the teachers' perspective in the sense of a bottom-up approach. When asked about the support needed for teaching ESD, teachers responded with the desire for more concrete teaching materials, more links to extracurricular partnership learning facilities, and more information on ESD. Teachers' answers to the second question about perceived barriers and obstacles to teaching sustainability issues supported this finding. Teachers clearly indicated the lack of teaching materials, training, and knowledge of how to implement ESD in practice. In a nutshell, one could say that from the teachers' perspective, there is no need for more policies, but for very concrete support close to teaching.

We assessed how teachers' characteristics (e.g., ESD-related curriculum knowledge, motivation, attitudes towards ESD) evolved over the past 12 years to answer the second research question. For this purpose, we used data from a 2007 study in which mainly the same questions were asked. We compared these data with the newly collected data from 2019 using descriptive and inferential statistical calculations. The results of this comparison were revealing. According to our study, teachers' attitudes towards sustainable development had significantly increased and their self-reported knowledge about the ESD term also substantially increased. In addition, 84.1% of teachers reported that they taught at least one ESD topic in 2019. This was an increase of 8.1 percentage points compared to 2007. In addition, significantly more teachers stated that they would teach ESD-relevant content in 2019, even if this would involve increased effort. Furthermore, we reported a significant increase in the teachers' estimation of the effect that ESD has on the students' sustainability behavior.

Despite these increases, a lack of development in a critical perspective on ESD implementation raises additional questions. We also asked teachers to assess the importance of ESD for the school. We assumed in advance that the new curriculum (established in 2016) with a strong emphasis on ESD would increase the importance in schools. From 2007 to 2019, however, there was no significant increase in the rating of ESD importance. Apart from the teachers' need for more concrete support for their lessons, ESD needs to be actively encouraged by the schools—as institutions—to convey the importance of ESD.

Our interpretations of the data are subject to limitations given that the findings are based on teachers' responses to a self-report survey. From an action-orientated and theoretical point of view, we recommend that methods should be developed to investigate how the different dimensions of sustainability knowledge, attitudes, and other factors in schools (e.g., perception of ESD effectiveness from both the teachers' and students' perspectives) influence their actual sustainability-related behavior (see e.g., [24–30]) or to conduct field studies to investigate actual ESD teaching practices in schools in more detail.

Another concern of self-report survey data is social desirability. Teachers' responses could have been influenced by the need to conform to perceived educational norms of ESD. However, the findings pertaining to the question about ESD importance in schools (Table 3) indicate that the teachers in 2019 were affected very little by social desirability—at least not to a higher degree than the 2007 sample—even if this aspect was not measured directly. For future studies, additional items to measure the effects of social desirability could be included, as well as measures to estimate teachers' self-efficacy [31].

One noteworthy issue with self-report surveys is scale refinement. Researchers often must decide whether to stick to established scales from earlier studies to ensure greater comparability or to adjust the scales according to the current state of research. Given that one aim of the present study was to compare the results to the 2007 study, we used the 5-point Likert scale for the measurement of SD attitudes that emerged from the national assessment of the German Environmental Consciousness Study [32] in 2002. In future studies, polarizing the scale might be preferable (i.e., an even-number of Likert-scale options) because a neutral or a middle value is often vague to interpret and respondents tend to choose the middle answer (see e.g., [33,34]). The methodological advantages of the Rasch model and new approaches of secondary analysis [35] might also provide solutions for future research. One last limitation of our study is that compared to the 2007 sample, the 2019 sample was relatively small. The sample size in 2019 is mainly due to the fact that the teachers' survey was embedded in a larger research design focusing on the assessment of students' competencies [16] and possible multilevel-effects emerging from teacher characteristics. However, both samples on the teachers' level constitute a random sample given that the schools for both measurement points were randomly selected. The results can therefore serve as an important basis for evidence-based policy evaluation of the new guiding principle on ESD that was officially implemented with the school curriculum in 2016. Our findings can clarify how ESD implementation could be fostered in schools by integrating the teachers' perspective.

## 6. Conclusions and Future Developments

Implementation theory—a research area emerging from political science—could serve as a further theoretical basis to gain insights into factors that foster and hinder ESD realization in school practice. Neglecting the bottom-up (teachers') perspective in the implementation of ESD policies leads to a situation in which the weaknesses pass unnoticed. ESD (policy) research should be directly linked to the classroom level, i.e., the level where those policies are supposed to be put into practice. Understanding the factors that foster or hinder teachers to consider ESD content in class is of paramount importance to realize GAP objectives. Other research also emphasized the importance of teachers and their convictions as a crucial level of analysis [36–39]. This approach stresses the crucial and active role teachers play in the implementation process and places more emphasis on the analysis of bottom-up processes. This technique of asking micro-level actors about their goals, activities, problems, and contacts has a

well-founded tradition in implementation research (see, e.g., [40–43]). From a political perspective, our findings suggest how to further integrate the street-level perspective in the policy implementation process. “[P]olicy is only finally made when laws or regulations are fully implemented, through subsequent processes that cascade from the initial declarations” (see [18], p. 213). There is a need to respect the interrelationships between the different fields and levels: “Institutionalization at the international level is an important marker for norm emergence. But it is not an end state” (see [44], p. 269). For the framework of this analysis, one possible cascade process is described in a very simplified way in the following example. The international policy of the GAP is transferred by national (educational) politicians, ministerial staff, and administrative officials in the form of a curriculum. The educational curriculum or guidelines intend to reach the classroom level. However, implementing a bottom-up approach parallel to the existing top-down approaches is (finally) necessary to ensure that at the classroom level, teachers and students are actually affected. In decision-making processes, no matter on which level (e.g., political or school context), stakeholders need to apply a more holistic approach that uses all relevant factors that might help them to make the best decision possible for society and for the future. Thus, studies on ESD implementation process might help to further illuminate the interconnections between seemingly different realities of policy makers and the street ministers of education, i.e., the teachers.

There is still a long way to go towards attaining a real bottom-up integration of teachers’ needs and perspectives. The needs that the teachers express to be able to teach ESD-relevant subjects and the perceived obstacles that hinder the implementation should be taken seriously by ESD policy stakeholders. Clearly, ESD-relevant teacher training, materials, and the further structural integration of ESD in the teaching curriculum are therefore crucial aspects that are needed to increase teachers’ support for ESD implementation and to ensure the increased awareness of ESD importance for all sustainability stakeholders on a local and global level. It was, hence, the objective of this article to show the important role of teachers as a level of analysis and how they play a key role in ESD implementation.

The criteria applied to future ESD measures should reflect the democratic values that ESD seeks to promote (see e.g., [45,46]). The bottom-up, collaborative effort of teachers and other stakeholders, including scientists, should reflect institutional as well as individual learning (see e.g., [47,48]). Future measures should not be completely directed top-down, nor should they follow the ‘business as usual’ approach [49]. A more bottom-up orientated approach for ESD could also mean assessing, e.g., the teachers’ world views, their perception, knowledge and attitudes about ESD more often to integrate them in the decision-making process. Further measures should also guarantee a thorough connection to teachers and a deepened understanding of the realities in school. For example, a widespread use of delegate teachers could help in further “reducing the gap between ideology and reality in relation to ESD” (see [50], p. 71).

At the end of the first GAP on ESD, these findings should be interpreted as an urgent call for further and strong participatory actions in the direction of ESD on the classroom level given the pivotal role of education in reaching the goals of a sustainable society.

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## Abbreviations

BMBF	Federal Ministry of Education and Research
BW	Baden-Wuerttemberg
DUK	German Commission for UNESCO
ESD	Education for Sustainable Development
GAP	Global Action Programme on Education for Sustainable Development
SD	Sustainable Development
SDGs	Sustainable Development Goals
UN	United Nations
UN DESD	United Nations' Decade of Education for Sustainable Development
UNESCO	United Nations Educational, Scientific and Cultural Organization

## Appendix A

List of Possible ESD Topics
<b>Examples of Topics with Ecological Focus:</b>
• <i>Climate change, greenhouse gases</i>
• <i>Water scarcity</i>
• <i>Ecosystems (e.g., forest)</i>
• <i>Environmental protection put into practice (e.g., school garden)</i>
• <i>Biodiversity, etc.</i>
<b>Examples of Topics with Economical and Technical Focus:</b>
• <i>Global economy and globalization</i>
• <i>Consumption and life-style</i>
• <i>Sustainable mobility</i>
• <i>Resources consumption</i>
• <i>Renewable energies (e.g., solar energy), etc.</i>
<b>Examples of Topics with sociocultural Focus:</b>
• <i>Ensuring the basic needs: health, food, education . . .</i>
• <i>Human rights</i>
• <i>Intercultural cohabitation</i>
• <i>International Relations</i>
• <i>Global and local conflicts</i>
• <i>Migration, etc.</i>
<b>Examples of Overlapping ESD Topics:</b>
• <i>Sustainable Development/Agenda 21</i>
• <i>Population growth</i>
• <i>Mass tourism</i>
• <i>Recycling</i>
• <i>Sustainable development at the own school, etc.</i>

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