Article

Promoting Environmental Citizenship in Education: The Potential of the Sustainability Consciousness Questionnaire to Measure Impact of Interventions

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Abstract: Policy documents across the globe call for citizen engagement to fight climate change emergencies and build more sustainable societies. They also recognize the key role of formal and non-formal education in preparing citizens to address those challenges. However, there is a need to identify appropriate instruments to evaluate the impact of educational interventions on people's knowledge, attitudes, and behaviors, which are essential components of the action competence required to become environmental citizens and agents of change. The aim of this paper is to investigate the potential of the Sustainability Consciousness Questionnaire (SCQ) to evaluate different educational interventions aimed at increasing environmental citizenship. It presents three sub-studies from Spain, Belgium, and Sweden using the SCQ with varying contexts, duration, and target groups yet sharing common pedagogical features in the interventions. Pre-intervention scores indicate a common pattern of high sustainability knowingness, moderate sustainability attitudes, and lower sustainability behaviors in the three dimensions (environmental, social and economic) of sustainability consciousness, and a positive impact on sustainability behavior after the intervention. These findings are especially significant when compared to previous studies. We therefore conclude that the SCQ is useful for detecting the effects of learning interventions of varying designs and contexts that address environmental citizenship. The results are discussed in terms of key pedagogical features of the educational interventions, and the appropriateness and sensitivity of the instrument in detecting changes in the intended direction. It concludes with implications for research and practice and suggestions for future lines of work.

Keywords: environmental citizenship; Education for Environmental Citizenship; educational impact; Sustainability Consciousness Questionnaire; educational intervention

1. Introduction

Current societal and environmental challenges can only be faced by aligning personal values and behaviors with political aims and measures through a process of cooperation. This will help maximize our capacity as human beings to achieve sustainable development goals through societal transformation [1].

Education plays a key role in preparing environmental citizens able to develop their full potential to actively participate in the generation and implementation of creative

and sustainable solutions. However, what kind of education equips individuals with the knowledge, values, dispositions, and skills necessary to become environmental citizens? According to Hadjichambi & Paraskeva [2], the answer to that question is Education for Environmental Citizenship (EEC). EEC emphasizes active and contextualized learning linked to investigating and providing solutions to local environmental problems. This encompasses a wide range of processes such as inquiry, planning, acting, evaluating, and reflecting on results as well as expanding the impact of actions through networking and dissemination.

However, before scaling up educational interventions, it is necessary to evaluate their impact and provide rich contextual information that extends our knowledge and understanding of how to develop teaching approaches with the capacity to foster environmental citizenship. Addressing this need, we evaluate three educational interventions in formal and non-formal contexts that share a common goal: to promote environmental citizens. In particular, we focus on cases taking place in different national contexts (Belgium, Spain, and Sweden) that engage various age-groups.

The impact of each educational intervention was evaluated using the Sustainability Consciousness Questionnaire [3]. This instrument measures the impact of interventions on participants' knowledge, attitudes, and behaviors, enhancing their ability to become environmental citizens. In particular, we addressed the following research questions:

1. What is the impact of three different educational interventions aimed at promoting environmental citizens by increasing sustainability knowledge, attitudes, and behaviors?
2. What potential does the SCQ have to detect the impact of educational interventions in diverse contexts?

The analysis of participants' responses before and after different educational interventions provided us with useful empirical research evidence highlighting the potential of the SCQ to extend our knowledge of how best to evaluate and educate environmental citizens across different types of interventions, cultural contexts, educational contexts, and ages.

2. Theoretical Background

2.1. Environmental Citizenship

The term environmental citizenship began to draw international attention in the early 1990s and has recently generated increasing interest due to the climate crisis. Over the last few decades, different authors have tried to address general concerns about environmental issues by enriching traditional views of citizenship with new values and tenets.

Bell [4] approaches this concept from a liberal view of citizenship where freedom and pluralism go hand-in-hand with the preservation of human-rights, some of which have implications for the environment and its management. He groups rights into three categories: substantive rights, such as access to natural goods (clean water, clean air . . .), procedural rights (the right to participate in democratic processes relating to environmental issues), and personal rights, such as people's right to make green choices in the way they live their lives. However, it is important to note that, from a liberal perspective, the exercise of these rights is always a matter of choice, which raises several concerns.

For instance, other authors claim that leaving environmental issues to the choices of individuals may undermine our capacity as human beings to tackle current environmental, social, and economic challenges. Conversely, addressing these challenges from a republican environmental citizenship perspective would mean intervening to create norms essential for the survival of the political community and the protection of the public good. In this line of thought, John Barry offers one of the most influential works. He argues that the characteristics typically associated with classical republicanism (virtue, duty, obligation and public service) are best suited to the promotion of citizens aligned with environmental and social justice values [5]. The conception of citizenship proposed by Barry aims to repair not only environmental problems but also their roots and causes, pursuing structural as well

as lifestyle changes and seeking a balance between the extremes of excessive consumption and poverty.

However, the concept of republican citizenship remains strongly attached to the notion of the state and political boundaries, whilst environmental issues such as ozone depletion or climate change transcend national borders and demand transnational solutions and cooperation. The latter calls for a different citizenship model aligned with a cosmopolitan view and global citizens that think beyond national borders, exhibiting a greater sense of interconnection and interdependence [5].

Cao [6] discusses different attempts to accommodate environmental issues within mainstream theories of citizenship in a thought-provoking way, encouraging critics to scrutinize and analyze the concept of ecological citizenship, one of the main points of reference in the debate on environmental citizenship. Cao highlights the lack of attention paid to gender matters, its anthropocentric (human-centric) nature; and its potential for authoritarian politics. In addition, Cao [6] discusses a set of alternative and emerging theories that consider aspects of environmental citizenship often neglected by mainstream approaches. The most significant of these assert that gender matters, promote the incorporation of nature into citizenship, and argue the need to place democracy and pluralism at the heart of all conceptions of environmental citizenship. This sets the stage for the development of the environmental citizenship concept by the European Network of Environmental Citizenship, which is discussed later in this paper.

The increasing political interest in environmental citizenship is evident in the European Green Deal, which highlights the key role of citizens in addressing climate change and emphasizes the need to engage pupils, parents, professionals from different fields and the wider community in the changes needed for a successful transition to a green economy and a more sustainable and smarter planet. These transformations entail changes in personal behaviors to reduce carbon and environmental footprints, but also individuals' participation in collective actions to fight climate action and actively contribute to environmental protection [7]. Newell et al. [8] discuss the crucial role of behavior change in implementing the 1.5 °C target-consistent pathway set by the Intergovernmental Panel on Climate Change and highlight the importance of dealing with scale challenges in space and time to ensure individual and collective actions have a significant impact. An important question to address is what kinds of transformations are needed to impact people's individual and collective behaviors.

A strong emphasis is placed on promoting environmental awareness through formal and non-formal education. Pupils and students have the potential to become ambassadors for climate action and environmental protection by sharing their knowledge, experience, and engagement with their families, local communities, and with public and private decision makers. Combining educational interventions with other forms of civic engagement could lead to a more sustainable lifestyle and a healthier relationship with the environment; one that involves caring for biodiversity protection and stimulating the search for nature-based solutions to support climate resilience and sustainable ways of consumption and management [9].

However, to achieve these ambitious objectives through educational interventions, we must go far beyond the unproblematic transmission of knowledge or the promotion of certain sustainable behaviors within social norms and regulations. We need to consider ways of affecting individual and social fundamental values attached to personal and cultural identity [10]. These include the personal and social values that shape the philosophy of life and the means and procedures to ensure sustainable development, economic prosperity, and social justice, both internationally and intergenerationally.

This view aligns with the conceptualization of environmental citizenship provided by the European Network of Environmental Citizenship [11]. This holds that an environmental citizen exhibits the will and competences (understood as the efficient integration of knowledge, values, dispositions, and skills) to actively participate in resolving and preventing sustainability problems, enabling healthy relations with the environment and

ensuring intra and inter-generational justice [12]. In relation to the competences necessary to take an active role in sustainable development, action competence is defined as possessing the relevant knowledge, willingness, and self-efficacy needed to contribute to solving controversial problems [13–15].

Action competences that enable people to become agents of change in relation to sustainability issues are central ideas in the conceptualization of environmental citizenship. Sarid and Goldman [16] developed a theoretical framework to educate people on environmental citizenship based on Schwartz's theory of fundamental values [17]. They constructed a three-level framework of environmental citizenship (EC) (individual-level, community-level, and socially transformative-level), depending on the level of change agency exhibited by individuals. These authors emphasize change agency as a core element of environmental citizenship and argue that individuals' capacity to act as agents of change to solve structural causes of environmental problems depends on their openness to change and their distinct motivational values, ranging from self-enhancement to self-transcendent. Self-enhancement is a motivational value related to the opportunity to achieve personal goals and development, while self-transcendence reflects the motivation to act beyond self-interest for the common good [16]. Against this background, we conclude that environmental citizenship aims for action competence; the question that then emerges is how to achieve such action competence, and it is here that education comes to the fore, an aspect addressed in the following section.

2.2. Education for Environmental Citizenship

In view of the ambitious educational objectives linked to the generation of environmental citizens, it is essential to design educational interventions that bring about the intended learning outcomes. To address this need, Hadjichambis and Paraskeva-Hadjichambis [2] proposed a pedagogical approach to Education for Environmental Citizenship that emphasizes the role of active and contextualized learning linked to the investigation and resolution of local environmental problems or global ones with relevant local implications. The EEC approach considers the key characteristics of an environmental citizen as the starting or central point, and the outputs or potential outcomes of acting as an environmental citizen as the destination point.

The characteristics of an environmental citizen can be defined in terms of the *knowledge, skills, values, and dispositions* exhibited. These constitute the *competences* and *behaviors* necessary to act in an informed and successful way while addressing environmental issues. These elements are the core or central components of the personal development of an environmental citizen and are aligned with the cognitive and affective resources supporting action competence for sustainability [13]. Therefore, education for Environmental Citizenship should provide citizens with the action competences necessary to take an active role in the transformations required to build a more sustainable society, as well as the environmental and sustainability-oriented knowledge, attitudes, and values required to motivate them to take on responsibility for action [18].

The elements identified as destination points or outcomes of acting as an environmental citizen are termed outputs by Hadjichambis and Paraskeva-Hadjichambi [2]. The EEC outputs align with the definition of environmental citizenship and are presented in a non-hierarchical order as follows:

- Solving current environmental problems.
- Preventing new environmental problems.
- Achieving sustainability.
- Developing healthy relationships with nature.
- Practicing environmental rights and duties.
- Identifying structural causes of environmental problems.
- Achieving critical and active engagement and civic participation.
- Promoting inter- and intra-generational justice.

Based on these outputs, an environmental citizen should, according to the framework, support healthy relationships with nature, sustainability, and social justice beyond their close circle of relationships and think of the human being as a whole, thereby caring about the prosperity of future generations. To attain these goals, an environmental citizen should be able to critically reflect on the structural causes of sustainability issues and actively engage in the resolution and prevention of problems, exercising their rights and duties. These outputs of the framework may be the result of a wide range of actions undertaken at an individual or collective level, in the private or public sphere, and with a local, national, or global impact. Therefore, in addition to the central elements of personal development and the intended outputs, the pedagogical approach of EEC entails different dimensions (individual or collective), spheres (private and public), and levels (local, national and global).

As seen from the definition of the central elements of personal development and the intended outputs, the pedagogical approach to education for environmental citizenship aims to guide peoples' behavior in a more sustainable direction with a focus on developing citizens' action competence. To accomplish that aim, the pedagogical approach needs to engage with the personal characteristics of each learner in meaningful and authentic contexts. However, what are the key processes conducive to the intended learning outcomes and outputs? Hadjichambis and Paraskeva-Hadjichambi [2] propose a pedagogical approach that consists of the following stages: inquiry, planning actions, civic participation, networking and sharing in scales, sustaining environmental and social change, and evaluation and reflection. In the following, we briefly comment on each of these stages: In the *inquiry stage*, individuals raise questions about local issues with global implications and collect evidence that will allow them to better understand the environmental problems at stake and their structural causes. This will empower them to make informed decisions as to what can be done. The information collected and the understanding developed in the inquiry stage may be used to plan informed and effective *actions*. These actions could extend the impact on the solutions developed and contribute to the prevention of new sustainability problems by promoting *civic participation*, using dissemination and *networking* processes for scaling up. An important emphasis is placed on *sustaining* environmental and social *change* in the intended directions and on promoting *evaluation and reflection* as a means of ensuring an increased understanding of the key issues and continuous improvement.

Hadjichambis and Paraskeva-Hadjichambi [2] drew attention to the fact that the different processes or stages are not applied in a linear fashion, but can be started at any point and follow any sequence in order to better adapt to the environmental issue being addressed and the needs and interests of the agents involved. Moreover, it may be the case that not all stages are covered in a particular educational intervention; instead, just some may be addressed, depending on the nature and context of the intervention. These stages are enshrined in different pedagogical approaches widely recognized in the specialized literature, which are part of what has been described as the *pedagogical landscape* of education for environmental citizenship. This landscape includes approaches such as problem-based learning, socio-scientific inquiry-based learning, placed-based learning, community service learning, action-competence learning, and the pedagogy of eco-justice.

Previous works have discussed these and other pedagogical approaches striving to understand what kinds of processes are conducive to the learning outcomes necessary to generate environmental citizens. According to Činčera et al. [19], effective interventions are *constructive*, *collaborative*, *critical* and *reflective*, providing useful opportunities to develop *ownership* and *responsibility* for environmental issues, along with a sense of *empowerment* as citizens who can actively contribute to improving the world around them. The pedagogical approach to education for environmental citizenship proposed by Hadjichambis and Paraskeva-Hadjichambi [2] exhibits all of these characteristics. However, it is vital to develop a better understanding of the various ways in which this pedagogical approach might be enacted, as well as their impact on environmental citizenship.

Moreover, the enactment of environmental citizenship is dependent on various aspects of how a school is organized and functions [20]. Aspects of the specificity of curricula, the way the local school is organized, and the predominant assessment and teaching traditions bring important challenges to implementing education for environmental citizenship in formal settings [21]. In addition, the curriculum, school organization, and traditions of teaching and assessment differ substantially in different countries, across school levels, and in formal versus informal education [21]. Therefore, the way EEC is implemented and orchestrated will need to be adapted to the local context, and as a consequence its impact might differ between these contexts. It is thus important to conduct studies in various cultural and organizational contexts where the initiatives and interventions that enact EEC are investigated, which is the aim of this study. Moreover, evaluation instruments like the SCQ might respond differently to these various contexts, hence it is important to investigate the potential of instruments to detect intervention effects in different contexts.

2.3. Measuring Outcomes of Environmental Citizenship Education

To investigate the educational outcomes or effects of pedagogical initiatives in line with EEC, instruments are needed to measure the intended learning goals of such initiatives. However, because the holistic perspective of the environmental citizenship model covers multiple aspects and dimensions, it is challenging to find one single instrument that can evaluate aspects of the EEC model. A holistic instrument covering several psychometric constructs, topic domains (the environment, society, and economy), dimensions (individual and collective), and spheres (private and public) is therefore desired. In the work within the Europen Network for Environmental Citizenship (ENEC), questionnaire instruments with such a capacity were inventoried and suggested, and the one identified as possessing the measurement requirements was the Sustainability Consciousness Questionnaire, also known as the SCQ [22]. Therefore, in this study the SCQ was used as an evaluative instrument in a pre–post study to investigate the effects of various interventions.

The SCQ-instrument measures the concept of Sustainability Consciousness [3]. Human consciousness is exemplified by all things we can observe or experience [23], thus SC refers to human experience or the awareness of sustainability phenomena [3]. The SCQ is an instrument that operationalizes SC into a research tool and also provides the possibility to measure knowingness (recognition of the importance of sustainability), attitudes (the attitudes towards sustainability), and self-reported behavior (the willingness to act towards a sustainable future) in relation to the three pillars model of sustainable development dimensions (environment, economy and society), as presented in Figure 1. The instrument was originally developed and fully validated in Sweden in an educational context [3], but it has also been successfully used and validated in countries such as Spain [24], Pakistan [25], and Taiwan [26].

As indicated in Figure 1, the SCQ includes items covering the three dimensions of sustainability; environment, economy, and society. Each item also reflects either knowledge, attitudes, or behavior, which corresponds to the inner circle of the environmental citizenship model. Sustainability Consciousness explicitly refers to the following goals of Environmental Citizenship: achieving sustainability, preventing environmental problems, solving environmental problems, addressing structural causes of environmental degradation, promoting intra- and inter-generational justice, achieving critical and active engagement, and civic participation. The SCQ primarily investigates individual actions in the private sphere, but some items also relate to the public sphere. Given the holistic and broad coverage the SCQ-instrument provides, it is useful to empirically investigate its potential to discern the effects of educational interventions aimed at developing environmental citizenship in diverse cultural and educational contexts. The SCQ-instrument exists in a long version (SCQ-L) comprising 49 items and a short version (SCQ-S) comprising 27 items. In the studies presented herein, the short version was used.
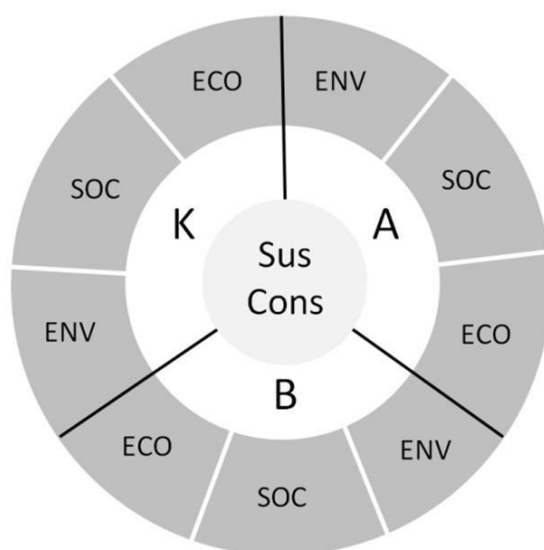
Figure 1. Conceptual representation of Sustainability Consciousness. K = knowingness; A = attitudes; B = behaviors; ECO = economic; SOC = social; ENV = environmental; Sus Cons = Sustainability Consciousness (taken from [3]).

3. Materials and Methods

In line with the background, aim, and research questions, this section first describes the contexts and interventions of the three cases in Spain, Belgium, and Sweden (see also Table 1). Secondly, we describe the common survey used to evaluate the educational impact of each of the initiatives: the sustainability consciousness questionnaire (SCQ). Finally, we describe the common analytical approach employed for the investigations in each of the three cases.

Table 1. Descriptions of the three interventions.

	Spain	**Belgium**	**Sweden**
Sample	*n* = 68	*n* = 104	*n* = 495
Male	34%	50%	62%
Female	66%	48%	35%
Undisclosed	0%	2%	3%
Age	25–70 years	12–14 years	17–18 years
Education type	Non-formal	Formal	Formal
Education level	Adult education	Lower Secondary education	Upper secondary education
Intervention length	1 day	1 semester	1 school year

3.1. The Spanish Case

3.1.1. Context and Sample

The Spanish case focuses on the evaluation of a 1-day sustainability workshop offered to adults voluntarily participating in a regional program aimed at raising sustainability consciousness in rural areas with less than 100,000 inhabitants through non-formal education intervention. The study comprises a convenience sample of 68 participants, distributed among three different rural areas (23 males and 45 females), with ages ranging from 25 to 70 years and with different levels of education (primary, secondary, and higher education).

3.1.2. Intervention

The intervention consisted of a 3 h interactive workshop conducted by the facilitator. The main focus was on eliciting participants' preconceptions, raising awareness of current sustainability issues through the use of multimedia and interactive games, and promoting reflection and discussion on structural causes and how current environmental problems

could be prevented or solved through individual and collective actions. In the following section, we provide a more detailed description of the intervention.

Pre-Intervention

The questionnaire on sustainability consciousness was distributed before the informal educational intervention. The short version of the questionnaire developed by Gericke et al. [3] was used for the pre-test and post-test to collect data on outcomes of the environmental and sustainability education intervention. This not only served to measure the change induced in the participants by the educational intervention but also served as the starting point for their learning experience. After completing the questionnaire, participants were invited to take part in a discussion to elicit their initial ideas about sustainability. The debate in which they engaged connected with the inquiring, evaluation, and reflection processes included in the EEC pedagogical model. During the session, different activities were performed and orchestrated by the facilitator using a PowerPoint presentation.

Videos and debate: The session started with the video: 'La historia que tú estás formando' (the history you make) (https://www.youtube.com/watch?v=ovvKUho-cHc (accessed on 13 October 2021)), 2.45′ video by the UN. Participants were then asked to answer two questions: the first of these was "What do we understand by sustainable development?" Each participant wrote the answer on post-it notes and was then asked to read it aloud, stimulating the debate. The second question asked was, "What do you think the Sustainable Development Goals are?" This was followed by a few minutes of discussion in which personal answers to the questions were shared. A second video, "Los Objetivos del Desarrollo Sostenible; qué son y cómo alcanzarlos" (https://www.youtube.com/watch?v=MCKH5xk8X-g (accessed on 13 October 2021)), 6′ by UNESCO, was then presented to introduce the Sustainable Development Goals (SDGs).

Games: The game "Take all today or all take always" by McKeown et al. [27] was designed to help participants learn how to manage natural resources in a sustainable way without compromising future generations and, consequently, consider the effect on the environment. Games based on simulations of real situations made the participants realize to what extent their own decisions and actions have an effect at local, regional and global scales. This connects with the planning and acting processes within the EEC pedagogical model. The facilitator explained the three different dimensions in the sustainable development concept (social, environmental, and economic) and started to play the second game "The three dimensions of sustainable development". Each group of 4 people had a list of the 17 SDGs and were asked to assign at least one dimension to each SDG. Finally, the facilitator introduced the 5R conceptual framework on waste management (reuse, reduce, repair, rethink, and recycle). To boost the debate, participants were asked the following question: "What ideas can you provide for materials recycling?" The third game, Recapacicla, focused on the different types of waste, their correct classification, and the time taken for each to disappear in the environment in order to focus on the environmental dimension of sustainability.

Introduction of new concepts: Ecological rucksack: The concept of ecological backpack [28,29] was explained. The participants were asked to give their opinion on second-hand buying, generating a debate. The role of NGOs and volunteering associations was also explained to connect with the social aspect of sustainability. SDG 1, poverty eradication, was presented and participants discussed the economic and social dimensions of sustainability, which made it easier to identify the structural causes of environmental problems and align the intervention activities with the EEC outputs.

Post-Intervention

Finally, participants were asked once again to complete the questionnaire on sustainability consciousness in order to determine whether there had been any variations in their level of sustainable consciousness, and whether such variations were statistically significant. The workshop was designed to engage participants in the exploration of con-

temporary issues related to the impact of human activities on the planet. It also aimed to promote discussion and reflection on structural causes and how particular issues might be solved or prevented, which calls for personal responsibility and engagement and the undertaking of individual and collective actions.

3.2. The Belgian Case

3.2.1. Context and Sample

The Belgian case includes data from a single secondary school that participated in a large-scale research and development project known as VALIES (VALorization of integrated and action-oriented Education for Sustainable Development, see, e.g., [30], which aimed to build teachers' competences to implement education for sustainable development. The school is located in a suburban area in Flanders, the Dutch-speaking community in the north of Belgium. Through their participation in the VALIES project, the teachers implemented a school-wide intervention throughout the year (see Section 3.2.2). Given the specific focus of the research aspect of the project, only students in grades 7 and 8 were surveyed: in total, 104 students aged 12–14, all from four general education class groups, participated in the survey. A total of 50% of the participants self-identified as girls, 48% as boys, and 2% chose not to disclose their gender. However, students from grades 9–12 also participated in the project at school (albeit located at a different campus), without participating in the survey. All student data were collected online and on two separate occasions: before (September 2019) and after the intervention (June 2020). Drop out was minimal, with just one student missing in the second phase of data collection. An important point to highlight is the schools' motivation to take part in the VALIES project, which was two-fold. Internally, the school was motivated to work on a shared school-wide project focusing on the development of students' sustainability literacy as well as building a feeling of community and collective efficacy within the school. Externally, the school aimed to respond to the new curriculum in Flanders, which came into action in September 2019 and in which sustainability and citizenship competences are now at the core of the objectives for formal education [31].

3.2.2. Intervention

Within the VALIES project, teacher teams from approximately 60 schools participated in a teacher professional development program that focused on designing and implementing education for sustainable development. For the current study, we focus on the student results of a single school. Below, we briefly sketch (a) the teacher professional development program, and (b) the intervention developed and implemented by the teachers in their own school.

The Teacher Professional Development Course

Between September 2019 and June 2020, selected teachers ('core teams') from each school took part in four joint training days, each with a specific focus, to acquaint them with the principles and practices of education for sustainable development. In between training sessions, VALIES staff members visited schools multiple times to provide tailored support, focusing on Education for Sustainable Development (ESD), group dynamics, and identifying and overcoming barriers. Following an intake interview in September 2019 to clarify the schools' motivations to participate and to identify goals and expectations, an initial kick-off was organized in October 2019. Here, the focus was on familiarizing students with the ESD principles of holism, pluralism and action-orientation, which form the core of the VALIES pedagogy [31]. An inspiring example of an ESD practice at school was then discussed in small mixed groups to illustrate these principles in a concrete situation. In November 2019, core teams were again gathered for a training day with a focus on the diversity of possible approaches toward integrating the SDG into teaching practices. One primary aim of this training session was to open up the concept of sustainability to cover the full range of interconnected sustainable development goals. Core teams were also supported in designing action plans to implement ESD in their own practice. Between

the second and third training session, the teams experimented with these implementations. Experiences with and reflections on these experimentations formed the core of the third training session in February 2020. Here, teams were further inspired to expand their projects, incorporate educational evaluation, and explain to each other how the key principles of holism; pluralism and action-orientation, are present within their projects and or plans. After this session, the school teams scaled up to full implementation. Plans were made for a fourth session in June 2020, but this was replaced by an online intervention session in February 2021 due to the COVID-19 outbreak. Several schools dropped out of the project due to the pandemic, reduced their ESD projects or postponed them to the next academic year. The school focused on in the current study is one that continued with full implementation even though it had to switch to online teaching between April and June 2020.

The School Project

All the students (grades 7–12, across different campuses) participated in this whole-school project, which was designed by the teachers to facilitate action taking by students. The students in grades 7 and 8, of whom we include SCQ data in this study, focused thematically on climate change. They followed several steps in their educational process that aligned with the EEC pedagogical model [2]. First, in small groups of about five students they explored a specific issue related to climate change in Belgium from diverse sustainability perspectives. Examples of these issues are depleting ground water levels, increased viticulture opportunities, and climate refugees. The students researched these issues from two approaches: (1) understanding the underlying scientific processes (natural science) and (2) stakeholders' perspectives (social science). Students surveyed their families and inhabitants around the school on opinions relating to their specific climate change issue. In the next phase they analyzed data and, through the pedagogical tool of 'student expert groups', informed each other about these issues. Students were then supported in acting within their own action radius. This included active and guided exploration of their own possibilities, visualizing and communicating different possibilities, mapping their potential impact, and selecting and bringing into practice specific actions. For some students, these were individual actions in their own lives (e.g., reducing meat consumption), for others they were collective action (e.g., developing a climate awareness video). These steps align with the EEC pedagogical model with one step missing: mapping the impact of their own actions. Although as researchers we studied the impact of the intervention on the students' SCQ, the students did not map the net environmental and social impact of their own actions. This is partially due to COVID-19, which shifted priorities in the school.

3.3. The Swedish Case

3.3.1. Context and Sample

The Swedish case includes an investigation of the development of environmental and sustainability education in an upper secondary school. After the compulsory school level in Sweden (grade nine), almost all students continue to an upper secondary (grade 10–12) school program according to their specific interests, which is either a vocational or a theoretical program. The school representing the Swedish context offers two theoretical programs; the students therefore attended either the science program or the technology program. The upper secondary school is located in a municipality with almost 100,000 habitants. In total, 495 students in grades 11 and 12 (between 17 and 18 years old) participated in a pre-test in early September 2018. About eight months later, in April 2019, 438 of the students in these two grades (now aged between 18–19 years old) participated in the post-test. Of these, 35% were girls, 62% were boys and 3% did not want to acknowledge themselves as either boy or girl.

3.3.2. Intervention

In this environmental and sustainability education intervention, all the teachers in the upper secondary school attended a teacher professional development program on environmental and sustainability education. The idea behind the professional development program was to support the teachers in developing an EEC approach to teaching and learning (see [2,32]). In addition, the program was designed to result in the development of important environmental and sustainability education outcomes and competences at the student level (see, [33]). The investigations in this Swedish context therefore focused on investigating the effect of an intervention in terms of students' sustainability consciousness.

The Teacher Professional Development Course

All the teachers in this upper secondary school participated in the teacher professional development program, which included four full day or half day seminars, the first in August 2017 and the last in November 2018. In these seminars, lectures, and workshops, discussions took place that were related to environmental and sustainability education. The first three seminars aimed to develop teachers' knowledge and self-efficacy regarding environmental and sustainability teaching and learning. The fourth seminar focused more directly on transforming the teaching at their school to be more cross-disciplinary and to adopt a more action oriented, participatory, and democratic EEC approach to teaching [2]. A summary of the seminar occasions for the teachers is presented as follows.

- August 2017. A full day seminar focusing on what environmental and sustainability education is. Components of the EEC approach were introduced.
- November 2017. A half day seminar including a workshop on what an EEC approach to teaching could look like for the teachers.
- June 2018. A half day seminar on examples of how to arrange cross disciplinary teaching at the upper secondary school level. The day included both a lecture by a researcher/teacher with experience of cross disciplinary teaching at the upper secondary level and work team discussions.
- November 2018. A final full day seminar focusing on hands-on activities for work teams on how to transform environmental and sustainability teaching and learning into an EEC approach at the school.

The teachers also worked in their teams at the school in between the seminars and engaged in regular meetings on a weekly basis. In these sessions, the teaching of students and the development of environmental citizenship and competences for sustainability were discussed along with other practical and urgent issues that were part of teachers' teamwork. Once each semester, two researchers met the school leaders to plan and discuss how to conduct the development program with the teachers and the intervention with the students. Moreover, to support the work teams, two teachers worked 20% each as facilitators to support the environmental and sustainability education development process. The facilitators regularly met two researchers and facilitators from other schools in the municipality to discuss and support each other in the development of sustainability teaching and learning at their schools (two-hour meetings three to four times each semester).

Research suggests it is important to include the student level when investigating the effects of a teacher professional development program such as the one described above (e.g., [33,34]). In this context we therefore investigated the outcomes at the student level by collecting student data in a pre-test and a post-test during a period where students took part in the planned environmental and sustainability teaching and learning intervention. The pre-test was assigned some time into the teacher professional development program, as the teachers spent a great deal of time incorporating input from the three first seminars and related work team discussions into their teaching and intervention with the students. The pre-test therefore took place at the beginning of September 2018, before the final "hands-on" seminar. The post-test was administered approximately one school year later in late April 2019, a sufficient period of time after the final seminar for teachers to ensure they had time to implement their plans into environmental and sustainability teaching and learning at

their school. The short version of the sustainability consciousness questionnaire [3] was used to collect pre- and post-data on the outcomes of the environmental and sustainability education intervention at the student level.

The School Project

In connection to the seminars described previously, the Swedish teachers started to involve the students in sustainability interventions through their teaching and through extracurricular activities. The facilitators at the school gathered volunteer students from each class (approximately 20 students) to work as *sustainability ambassadors* at the school. In line with the EEC approach, the intention was to involve students in decision-making and action taking at their school by including the environmental, economic, and social perspectives of sustainability. The student school ambassadors met every second week with the goal of improving sustainability at the school. They worked on minor issues such as actions to reduce disposable materials and waste products in the cafeteria, but also with larger projects. One example of such a larger project was the congress on circular economy arranged by the students at the school. At this congress, different local companies and municipality representatives were invited to explain how they practice circular economy. In connection with the congress, and for students to practice circular economy themselves, they arranged an exchange of secondhand clothing at the school. Students could bring clothes that they did not use anymore, or were tired of, and exchange these with others for free instead of buying new clothes.

Additionally, in line with the EEC approach, the teachers initiated international sustainability collaborations with two other schools in two African countries, enabling the students to exchange their local sustainability experiences in a global context. This project involved teachers from different school subjects, which meant cross-disciplinary work and the possibility for students to interconnect different subjects through teaching and learning. At the time of the post-test, this international sustainability collaboration was awarded and the school became one of three *Life Schools* in the world (see https: //life.se/projects/life-schools/ (accessed on 15 August 2021). To become a Life School, the entire school had to be permeated by sustainability work and sustainability action-taking. The teaching and learning at the school also had to deal with issues connected to the 17 global sustainability goals. The award means that the school can continue the development of the EEC approach locally and exchange experiences with others globally.

3.4. Instrumentation

The short version of the Sustainability Consciousness Questionnaire (SCQ-S) was administered before and after the intervention. The SCQ-S consists of 27 items evaluated using a 5-point Likert scale (totally disagree to totally agree with a neutral option in the middle). Items represent the environmental, social, and economic components of sustainable development within three dimensions: sustainability knowingness, sustainability attitudes, and sustainability behaviors. The sustainability knowingness, attitude, and behavior items reflect (i) what people acknowledge as necessary features of sustainability (e.g., the environmental item: Reducing water consumption is necessary for sustainable development), (ii) feelings about sustainability and what people think about sustainability issues (e.g., the social item: I think that we who are living now should make sure that people in the future enjoy the same quality of life as we do today), and (iii) the self-reported behavior of people in relation to these issues (e.g., the economic item: I avoid buying goods from companies with a bad reputation for looking after their employees and the environment). The theoretical foundation and empirical validation of the instrument are described in Gericke et al. [3].

In the Swedish context, we administered the original Swedish version of the SCQ-S that was used with the participants in the original validation of the instrument (see Gericke et al., 2019). The internal consistency of the scale was well within the required parameters for a scale with good reliability (Cronbach's alpha was 0.842 for the scale as a whole).

The instrument was translated into Spanish with minimum modifications to adapt to the sample and the cultural context of the Spanish participants, while checking that the internal consistency of the scale remained high after translation (Cronbach's α = 0.786). A similar approach was employed in Belgium, resulting in an acceptable level of internal consistency (α = 0.853).

3.5. Analyses

We estimated the reliability of the SCQ for each of the three contexts by calculating a Cronbach's alpha value for the construct of sustainability consciousness, as well as for the three subconstructs: sustainability knowingness, attitudes, and behavior. We used a value of 0.65 as a cut-off for indicating good scale reliability [35]. After establishing reliability, we calculated a mean value for each subscale within each context and for the entire construct. Missing values were replaced with the respondents' mean values for the respective item. As we were not comparing the SCQ of respondents across the interventions, but rather the scales' potential to detect changes over time, we limited comparisons to a (M)ANOVA test for each separate intervention. Therefore, multivariate estimations of mean differences were made across time for sustainability consciousness, knowingness, attitudes, and behavior in Spain, Belgium and Sweden. In line with convention, we accepted statistical significance at a level of $p < 0.05$. Furthermore, to quantify the effect size of differences, we calculated a Cohen's d for each comparison, with values below 0.20 indicating limited effects, values between 0.2 and 0.5 small effects, values between 0.5 and 0.8 medium effects, and values above 0.8 large effects [36].

4. Results

This section is divided into two main sub-sections in accordance with the research question. We first describe the results concerning the impact of the three different educational interventions on promoting environmental citizenship in terms of participants' sustainability knowingness, attitudes and behaviors. We then present the results regarding the potential of the SCQ to detect the impact of educational interventions in diverse contexts.
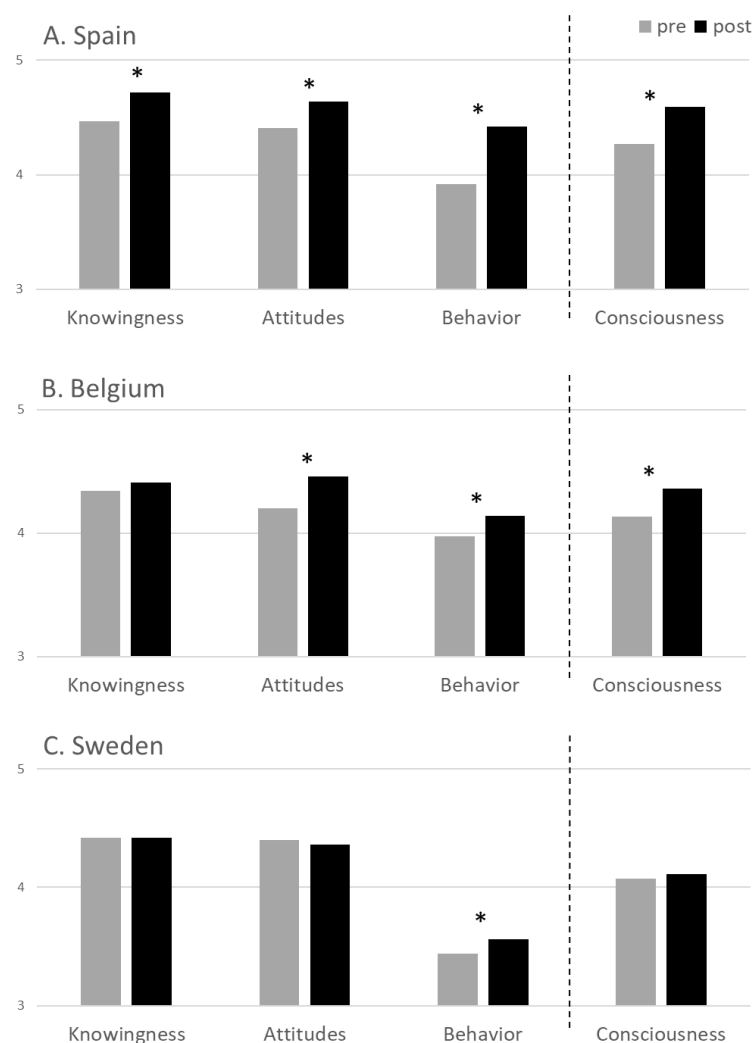
4.1. The Impact of the Interventions

Table 2 presents the results of the impact analyses for each of the interventions and for each of the (sub)constructs. For the Spanish intervention, the results indicate large effects both for the overall construct of sustainability consciousness and for each of the subconstructs, suggesting a full and balanced impact. For the Belgian intervention, the results indicate a large effect on participants' sustainability attitudes, a small effect on their behavior, and no effect on their knowingness. Overall, the Belgian respondents exhibited a large increase in sustainability consciousness. For the Swedish intervention, the effect was concentrated in the behavioral dimension and should be labelled as limited. Figure 2 summarizes these results and reveals a pattern that is similar in each country, with knowingness and attitudes displaying relatively high mean values and behavior exhibiting lower values. The results also highlight the consistent impact of all three interventions on the behavioral dimension of the SCQ. As discussed later in Section 5.2, we did not make statistical comparisons between the countries, but rather were interested in the impact of the interventions in each country as well as the patterns identified within that impact.

Table 2. Descriptive statistics and differences between pre- and post-test values for the entire scale (Sustainability consciousness) and subscales (Sustainability knowingness, -attitudes, -behavior) in each country.

Country	Construct	M ± SD (Pre)	M ± SD (Post)	M.diff	*p*	d
Spain	Sustainability consciousness	4.27 ± 0.92	4.59 ± 0.67	0.32	<0.001 *	0.935
	knowingness	4.47 ± 0.70	4.72 ± 0.48	0.25	<0.001 *	0.615
	attitudes	4.41 ± 0.91	4.64 ± 0.72	0.23	0.001 *	0.653
	behavior	3.92 ± 1.02	4.42 ± 0.73	0.50	<0.001 *	1.100
Belgium	Sustainability consciousness	4.13 ± 0.36	4.36 ± 0.39	0.23	0.001 *	0.613
	knowingness	4.34 ± 0.41	4.41 ± 0.45	0.07	0.211	0.155
	attitudes	4.20 ± 0.41	4.46 ± 0.42	0.26	0.001 *	0.626
	behavior	3.97 ± 0.54	4.14 ± 0.52	0.17	0.027 *	0.321
Sweden	Sustainability consciousness	4.07 ± 0.49	4.11 ± 0.52	0.04	0.332	0.063
	knowingness	4.42 ± 0.56	4.42 ± 0.62	0.00	0.984	−0.01
	attitudes	4.40 ± 0.54	4.36 ± 0.62	−0.004	0.303	−0.07
	behavior	3.44 ± 0.66	3.56 ± 0.67	0.12	0.008 *	0.174

* indicates significant differences at *p* < 0.05.

Figure 2. Impacts of the interventions on participants' sustainability consciousness (all items), knowingness (K-items), attitudes (A-items), and behavior (B-items) in each of the three countries: (**A**). Spain, (**B**). Belgium, (**C**). Sweden. * indicates significant differences.

4.2. Psychometric Quality of the SCQ

Table 3 presents the Cronbach's alpha values for the entire instrument as well as for each of the sub-constructs in each country The results indicate that the SCQ functions as a reliable instrument to measure the sustainability consciousness, knowingness, attitudes, and behaviors of respondents. All values surpass the 0.65 cut-off value. It should be noted, however, that for sustainability behavior the Cronbach's alpha value is only just above 0.65. Nevertheless, these results suggest it is meaningful to calculate mean scale scores for each of the (sub)constructs. Based on the mean values and standard deviations, the effect sizes in terms of Cohen's d in different contexts indicate that the instrument has the potential to detect small to large effects of the pre- and post-test (see Table 3). In Spain, the effect sizes were medium to large, in Belgium small to medium, and in Sweden they were small. Hence, the results suggest that the SCQ has the potential to detect the full spectrum of effects of interventions applied in different contexts.

Table 3. Cronbach's alpha values for the entire scale and subscale in each country.

Scale (Items)	Spain	Belgium	Sweden
Sustainability consciousness (27)	0.786	0.853	0.842
Sustainability knowingness (9)	0.756	0.772	0.789
Sustainability attitudes (9)	0.692	0.685	0.737
Sustainability behavior (9)	0.652	0.748	0.704

5. Discussion

EEC plays a key role in preparing environmental citizens with the ability to take action on sustainability issues [2]. It is important to develop educational initiatives in line with those incentives, and to evaluate the effects on students in order to fine tune the pedagogical approaches.

In this paper we set out to explore the potential of one specific measurement instrument to evaluate the outcomes of educational interventions that aim to build environmental citizenship in learners: the Sustainability Consciousness Questionnaire (SCQ). Previous research using this instrument has been performed mainly within single cultural contexts e.g., [24–26,37,38] and been cross-sectional by design. In the current paper we brought together data from three interventions from three different countries, each applying a pre-post design, and focused on a common learning outcome (environmental citizenship). We aimed to (1) describe the impact of the three different educational interventions in terms of sustainability knowingness, attitudes, and behaviors, and (2) explore the potential of the SCQ to detect the impact of educational interventions in diverse contexts.

5.1. The Impact of the Educational Interventions

While the three interventions differed significantly in relation to their length, target group, educational context, and level of education, there were important similarities in their pedagogical approach. The key elements present in the pedagogy of each of the interventions were as follows:

- Contextualization in authentic issues and real-life problems that help trigger participants' motivation and engagement.
- Opportunities for active learning through a wide range of activities (posing questions, designing investigations, collecting information, discussing and presenting results . . .).
- Value-driven actions aimed at achieving environmental protection, social and intergenerational justice, and the common good.
- An emphasis on decision-making and taking action after evaluating the available evidence and considering different perspectives and alternative arguments.
- Critical reflection on how things are and how they should be, identifying weak and strong points and areas for improvement.

In the studies conducted in Spain and Belgium, effects were found at both the first level of constructs, sustainability consciousness, and at the second level; sustainability knowingness, sustainability attitudes, and sustainability behavior. In Spain, all second level constructs demonstrated effects, while in the Swedish case effects were only found for sustainability behavior. Notably, effects for the sub-construct of sustainability behavior were evident in all three interventions; in their own context and with their own pedagogical approaches, these impacted positively on the sustainability behavior of the participants.

The reliability scores were close to or well over 0.7, as recommended in the literature. The somewhat lower results for some of the sub-constructs in the Spanish sub-sample could be explained by the rather low number of respondents ($n = 68$).

Given that (1) within EEC, the overarching goal of education is to influence and change the way citizens act, i.e., their action competence for sustainability [13], and (2) the intervention focused on diverse participants (ages ranging from 10 to 75 years), the ability of the instrument to recognize self-reported sustainability behavior is of great importance as an outcome variable for EEC. The current study thus empirically demonstrates that the SCQ is a valuable and appropriate tool to measure this central aspect of EEC, as previously theoretically advocated by Gericke et al. [22].

The results revealed high scores in the attitude and knowledge domains before the intervention, indicating that participants exhibit relatively high awareness of sustainability across its three dimensions (environmental, social and economic). The higher deviations in the Spanish case are consistent with the heterogeneity of this group, with a wider age range and mixed educational background (34% primary education; 29% secondary education; 37% higher education). The lower scores obtained in the behavioral dimension in the pre-test in all three study cases highlights the difficulty of developing behavioral changes in citizenship that could be effective in environmental protection or conservation [39]. Although behavioral science has made substantial gains in understanding how to encourage prosocial behavior, pinpointing the importance of social norms, risk communication, emotion, and choice architecture [40], a multi-scale approach is needed to effect behavioral changes [41].

The use of a pre-post questionnaire strategy provides evidence for the net value of the behavioral component after the intervention. This strengthens the proficiency of the specific pedagogical approaches used in the current cases that represent the EEC approach. For instance, place-based education offers students authentic opportunities to participate in effecting positive change within their local communities, impelling them to be agents of change [2]. During each of the three interventions, several steps of the EEC pedagogical approach were included: *Inquiry, planning actions, civic participation and evaluation,* and *reflection.* Additionally, the use of site-specific material and data made the message relevant and meaningful to the participants and engaged them in authentic environmental socio-scientific issues.

5.2. The Potential of the SCQ to Detect the Impact of Educational Interventions Aiming to Promote Environmental Citizenship

In three different cases in three different contexts, the SCQ-instrument demonstrated good potential to detect the learning outcomes of educational initiatives that align with EEC. An important finding of this study is that the SCQ instrument is a useful tool for pre-post design measurements of such learning outcomes. To the best of our knowledge, the instrument has not previously been used in such a study design. Moreover, our current study also shows that the SCQ can fruitfully be used in longitudinal studies in different countries (Belgium, Spain and Sweden) with different groups of respondents (different educational backgrounds, ages from 13 to 70 years) and using different lengths (one day, one semester, one year) and types of intervention (directly addressing the respondents, or addressing teachers in TPD that, in turn, teach students that are tested). The SCQ is clearly a versatile instrument that can be employed in many different types of sustainability and environmental citizenship interventions, as well as evaluations of these interventions,

using a pre-post design. None of the three studies used a retention post-test, which would be useful for future studies using the SCQ to include.

Regarding the SCQ's coverage of the EEC framework, we argue that SCQ primarily investigates individual actions in the private sphere, but some items also relate to the public sphere. However, aspects of citizenship connected to the EEC model that relate to practicing environmental rights and duties are not covered by the SCQ. If these are of interest in EEC interventions, the SCQ should be complemented with other instruments, suggestions for which can be found in [22] or in [42]. Moreover, if certain aspects of the EEC model are of specific interest, it might be necessary to go down to the item level of the SCQ and conduct an analysis, for example *solving current environmental problems* relates to item A 18, A 5, B 2 and K 9 ([3], p. 41). If so, it might be better to use the long version (SCQ-L) of the questionnaire rather than the short version (SCQ-S). The SCQ-L contains 49 items and is wider in its coverage of topics relating to environmental citizenship. Furthermore, it allows measurement of a third layer of sub-constructs as it can be applied to separately measure, using nine subscales, the knowingness, attitudes, and behaviors of people relating to the environmental, social, and economic dimensions of sustainability.

Several methodological considerations arise here. Firstly, we should investigate the possibility of ceiling effects [43] when using a Likert-scale such as the SCQ. Such effects appear when participants generally respond positively to the items in a scale, leaving little room for (a) a nuance or discrimination of responses at the higher end of the scale, and (b) growth over time as respondents in a longitudinal design tend to give high answers on the first measurement occasion. Neither scenario seems to be in place in the current study as SCQ scores in each of the three cases exhibit meaningful standard deviation in the pre-test and increase towards the post-test. These results suggest there is no ceiling effect for the SCQ in these cases

We should also highlight that in our analysis we could have chosen to make comparisons between the three different contexts, but purposefully avoided statistical cross-cultural comparisons due to the different groups in the three cases. However, such comparisons have been made elsewhere using the SCQ, for example between Sweden and Taiwan [26], and it is also possible to do this with the SCQ-instrument. Such comparisons would need to employ advanced statistical techniques based on cross-cultural comparability. Specifically, to meaningfully compare factors across distinct groups (such as countries), each item must be interpreted by respondents in the same way and function within the scale in the same way in each group [44]. Without establishing such invariance, cross-country comparisons are less robust. The next study on the horizon for the validation of the SCQ, and its potential to meaningfully compare the outcomes of education for environmental citizenship, is one that addresses the measurement invariance of the scale across specific cultural groups.

5.3. Action Competence and the SCQ

Even though invariance cannot be established, we can already explore several similarities that arise from our current analyses. If we look across the three contexts at the pre-intervention scores, there is a clear, recurring pattern of high sustainability knowingness, moderate sustainability attitudes, and lower sustainability behaviors (see Figure 2). This pattern elicits several lines of thought that are valuable to reflect upon. Within the competence approach to teaching and learning environmental citizenship, a balanced profile of knowingness, attitudes, and behaviors comes into focus as an outcome: learners need all three elements of the competence in order to meaningfully act on environmental issues. Each of the interventions we described and studied managed to increase (self-reported) sustainability behavior among their participants. The magnitude of the effect was different in each country (see Table 2) but, given that we did not perform measurement invariance testing, we cannot compare the outcomes across contexts. Nevertheless, the effect is significant within each context. This finding is intriguing because, in a review study, Ardoin and colleagues [45] conclude that this kind of effect typically exerts very

limited influence on the behavioral outcomes (e.g., [46,47]). Moreover, even though there is an effect on cognitive outcomes, such as knowledge, this correlates to a very low degree with behavioral outcomes (e.g., [48]). In this study, however, we identified the strongest effects in the behavioral rather than the cognitive domain (knowingness). This indicates two things. Firstly, the interventions appear to achieve EEC's aim of developing students' action competence, which is a prerequisite for sustainability behavior. Secondly, the SCQ seems to have a good ability to capture the action dimension of student outcomes in the interventions. This is supported by results from a previous study where the SCQ significantly correlated with an instrument measuring self-perceived action competence for sustainability (SPACS-Q; [38]). Both are extremely positive results. Further studies are therefore required to explore these aspects further.

6. Conclusions

In conclusion, our results indicate that the SCQ is sensitive enough to register significant learning outcomes as a result of learners participating in EEC interventions, measuring their impact in pre- and post-test longitudinal study designs. Moreover, the results provide evidence for the impact of participation in short-term educational interventions as well as those using longer interventions. Additionally, we have demonstrated that the SCQ is useful in both formal and non-formal education scenarios. However, because the EEC framework is complex and covers multiple aspects of citizenship, it might need to be complemented with other instruments when evaluating educational interventions, depending on what specific aspects of EEC need to be evaluated.

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