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Enhancing Teachers' Self-Efficacy Supported by Coaching in the Content of Open Schooling for Sustainability

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Abstract: Developing teacher self-efficacy can be supported through coaching, a process that guides and supports teachers in enhancing their confidence in teaching and learning skills. This study, part of the CONNECT project funded by the European Union and implemented in various countries, investigates how coaching improves teacher performance and self-efficacy within the context of open schooling for sustainability. The coaching process underpinned by the CARE-KNOW-DO framework focused on 45 coaches supporting a total of 790 teachers in the UK, Brazil, Romania, and Spain. A multilanguage digital platform provided resources, guidelines, video, and best practices on open schooling integrated with the Sustainable Development Goals for teachers' educators and teachers. Through a qualitative study analyzing CARE-KNOW-DO practices in one-on-one dialogue-based strategies, collaborative participatory research, webinars, workshops, and professional development courses, our findings reveal both challenges and catalysts in coaching. Key features of the coaching model that boosted teachers' self-efficacy included working with mixed-ability classes (UK), overcoming curriculum pressure (Spain), and addressing complex teaching challenges (Romania). Pedagogical changes involved the adoption and co-creation of open schooling materials, along with integrating CARE-KNOW-DO principles and the EU DigComp framework for green digital skills. These insights demonstrate that coaching in open schooling environments for sustainability can significantly enhance teachers' self-efficacy and the quality of open schooling experiences by increasing teachers' awareness of challenges, strategies, and outcomes, focusing on meaningful practices, enhancing teaching and learning competencies, and fostering collaborative personal development.

Keywords: teachers' self-efficacy; open schooling; sustainability; coaching; CARE-KNOW-DO framework; CONNECT project

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1. Introduction

Teacher self-efficacy refers to the confidence they have in their ability to effectively influence their students and manage their responsibilities in the educational environment. It is a crucial component of teaching performance and success, being a concept that was originally developed by psychologists [1] and applied to the educational context for understanding how teachers perceive their competencies and ability to effectively manage their tasks and responsibilities in the learning process. Practically, self-efficacy considers "people's convictions" (regarding their capacity to achieve certain purposes), which "influence their success in relation to the planned activity" [2]. Bandura launched the idea according to which "individuals who feel that they can influence the result of an action, become more confident, they have a feeling of power and control, they are better mobilized

and make more effort to meet their objectives". He also defined perceived self-efficacy [3] that represents "people's beliefs in relation to their own capacities, beliefs that determine their way of feeling and thinking, the way they find their motivation and choose to behave; a strong feeling of personal self-efficacy improves one's personal well-being and achievements, the difficult tasks reach the point when they are perceived as challenges and not threats". The feeling of self-efficacy generates interest, profound involvement in, and a strong commitment to carry out planned activities.

On the other hand, individual success represents an important issue when building the feeling of self-efficacy. The same aspect is considered when receiving feedback from others, self-observation, and comparing with others. The authors of [4] assert that "individual performances are the best guide for evaluation of self-efficacy—therefore, personal success generates a strong sense of efficacy".

Concerning the teaching staff, [5] underlined the importance of personal convictions related to the capacity for helping students to learn. Teachers with a high level of perceived self-efficacy make greater efforts when carrying out activities and persevere when encountering difficulties. By contrast, the ones with a lower level of perceived self-efficacy invest less effort and give up when they consider that their chances of success are non-existent.

Despite extensive research on the importance of teacher self-efficacy, there are significant gaps in applying these concepts within sustainability education and open schooling. Most studies focus on traditional classrooms, overlooking the challenges of interdisciplinary content, diverse students, and real-world problem-solving in open schooling. Additionally, the role of coaching in enhancing teacher self-efficacy in these settings remains underexplored. This study addresses these gaps by investigating how the CONNECT coaching model, using the CARE-KNOW-DO framework, supports teachers in integrating sustainability education while overcoming challenges like limited resources and curriculum alignment.

In this respect, teaching self-efficacy is perceived as a teacher's confidence in the ability to spread knowledge, manage student behavior, and respond to student needs effectively [6]. This confidence influences student learning, as teachers with high self-efficacy are more likely to use effective teaching strategies and create a positive learning environment that encourages student participation and engagement. In this context, self-efficacy is strongly linked to the teachers' perceptions concerning the pedagogical competencies used in the teaching process, and their abilities to design the most suitable activities in relation to students' age, particularities, and objectives, but also influenced by several variables—proper equipment, specific resources, particular abilities, funding issues, etc. [7]. Going further, high self-efficacy helps teachers to be more resilient to challenges and failures [8], with great potential to assist teachers in coping with challenges and failures in the educational process. In this respect, teachers can identify mistakes or difficulties as opportunities to learn and improve their practice. It allows teachers to reflect on their teaching practices and continuously seek ways to improve [9]. This includes being open to feedback and opportunities for professional development.

It is obvious that teachers who demonstrate high self-efficacy can serve as positive role models for students [10]. Those who inspire confidence and motivation in their students can help them achieve their academic and personal goals.

In the actual context of sustainability, several barriers seem to be set up in the process of learning for sustainability [11], and schoolteachers' self-efficacy faces several challenges, especially addressing the following areas:

- *Knowledge* and *understanding*—many teachers feel they lack sufficient knowledge about sustainability concepts, making the teaching process difficult in that direction, since sustainability encompasses environmental, social, and economic dimensions.
- *Training* and *professional development*—now, professional development opportunities which are focused on sustainability education are extended in developed countries. However, a lack of or limited access to quality teaching materials and resources on sustainability can hinder teachers' ability to effectively teach sustainability subjects.

- *Curriculum* and *policy support*—a big part of the existing curricula may not adequately incorporate sustainability, leaving teachers without clear guidelines on how to integrate sustainability topics. It is also possible that national/regional education policies might not prioritize sustainability, affecting the emphasis and support given to such areas in schools.
- *Teaching strategies* and *pedagogical approaches*—teaching sustainability often requires innovative and interdisciplinary approaches, which teachers may feel unprepared to implement. Moreover, teachers might struggle with engaging students in sustainability topics, especially if they perceive those topics as abstract or irrelevant to their lives.
- *Teachers' personal beliefs* and *attitudes towards sustainability*—it is possible that teachers lack confidence in the importance or feasibility of sustainability, affecting their efficacy in this sense. Also, their personal values may not always be aligned with the principles of sustainability, which can create internal conflicts and affect their teaching approach.
- *Institutional* and *community support*—this is essential and crucial for implementing sustainability education. In addition, teachers may feel unsupported if there is a lack of engagement or interest from the wider community, including parents and local organizations.

The above-mentioned challenges require teachers to improve their knowledge, values, and necessary skills for integrating sustainability concepts into their daily lives and professions [12]. In this respect, it becomes essential to develop teachers' self-efficacy to incorporate sustainability into the teaching approach, together with real-life issues and open schooling practice. In this context, *open schooling* represents the approach where *schools collaborate with various stakeholders to act as catalysts for community well-being*. It encourages families to actively participate in school life and activities while engaging professionals from businesses, civic organizations, and the broader society to bring real-life projects into the classroom [13,14].

In the format proposed by the CONNECT project, open schooling was underpinned by the CARE-KNOW-DO framework with a large flexibility for teaching professional development considering local issues in communities, schools, and policymakers as well as national curriculum priorities [15,16]. The CARE-KNOW-DO model represents a pedagogical approach designed to engage students in caring about real-world issues with curiosity (CARE), acquiring contextual knowledge with interest (KNOW), applying problem-solving and analyzing decision-making skills with a sense of agency (DO) toward sustainability. Students engage with issues significant to their lives, their communities, society, and the planet. They learn curriculum knowledge purposefully to address these issues and act towards solutions. This process aims to make education relevant, fun, and engaging by empowering students with purpose and actionable knowledge in their lives, community, and the world [17].

Additionally, the CONNECT project integrates the DigComp EU framework, which emphasizes the development of digital competencies crucial for addressing sustainability challenges in education. DigComp focuses on five areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving. Within the CONNECT project, these competencies are applied to enable teachers and students to critically engage with sustainability topics using digital tools. For example, teachers and students utilize digital content creation to design campaigns and solutions for community-based sustainability projects. This integration ensures that teachers not only increase their self-efficacy in teaching sustainability but also develop digital skills that are increasingly essential in modern educational practices.

2. Developing Teacher Self-Efficacy Through Coaching (in Open Schooling Settings)

Teacher self-efficacy, understood as an educator's confidence in their ability to influence student learning and meet the challenges of the educational environment, can be enhanced through various strategies. These include setting realistic and measurable learning goals based on real-life issues, utilizing available resources to improve personal

pedagogical skills, collaborating with colleagues to share experiences and learn from one another, practicing positive thinking and stress management in challenging situations, and continuing professional training by participating in professional development programs.

In this respect, some key issues in developing the self-efficacy among teachers can be underlined [18]:

- *Belief in personal skills*—self-efficacy involves the belief that a teacher can plan, implement, and evaluate learning activities that lead to student success, being expressed as the ability to meet educational challenges.
- *Experience and feedback*—previous experiences of success or failure contribute to the development of teachers' self-efficacy. Positive and constructive feedback, from students, colleagues, and school management, can reinforce or change the teacher's ability perception.
- *Modeling and observation*—noting other teachers or mentors demonstrating effective skills can positively influence the teacher's self-efficacy. Modeling successful behaviors and practices can strengthen the confidence in the teacher's abilities.
- *Self-regulation and adaptability*—teachers with high self-efficacy can constantly evaluate their performance and adjust their strategies and approaches, according to the students' needs. This capacity for self-regulation and adaptability is essential in a constantly changing educational environment.
- *Resources and support*—proper access to appropriate resources and support from colleagues, school management, and other education professionals can significantly influence the teacher's self-efficacy. A sense of belonging to a strong educational community can build confidence and resilience in the face of challenges.

Moreover, teachers' self-efficacy is strongly linked to digital competencies nowadays, becoming crucial for effective teaching, especially in contexts imposed by sustainability education after the COVID-19 pandemic [19]. The COVID-19 pandemic has highlighted additional challenges and opportunities for teachers' self-efficacy in the context of sustainability, particularly regarding *digital competencies* and *open schooling*.

- It is obvious that many teachers were not initially prepared for the sudden shift to *digital learning platforms*, strongly influencing their ability to teach sustainability effectively online. In addition, teachers needed access to high-quality digital resources and tools, specifically designed for sustainability education.
- From the open schooling perspective, the pandemic has shifted the concept of *schooling beyond traditional classrooms*, where teachers made efforts to adapt to and embrace open schooling models that include outdoor, community-based, and virtual learning environments, requiring strong partnerships with community organizations, local businesses, and other stakeholders. More, it recorded an important rethinking of the didactic approach, through involving interdisciplinary and project-based learning, which can be challenging for teachers accustomed to traditional subject-specific curricula. Teachers had to develop interactive and engaging digital content to maintain the students' interest and participation in sustainability topics, and they were forced to emphasize student-centered learning approaches (inquiry-based learning, problem-solving) that can enhance engagement, but also with an impact on teaching strategies and confidence in facilitating such methods in an online format.

In such a context, developing teacher self-efficacy can be fulfilled through *coaching*, which represents a process whereby teachers are guided and supported in exploring and building their confidence in their teaching and classroom management skills. Practically, the coaching process aims to improve performance, being focused on the present rather than the distant past or future, considering the significant difference between "teaching someone" and "helping him/her to learn". In the real sense, coaching involves helping individuals improve their own performance and learn. Moreover, coaching aims to improve the quality of life for individuals or groups, by increasing awareness of reality and focusing on results [20].

In recent decades, coaching has been used for personal development, as well as for addressing life issues (life coaching), and in various professional fields such as education, sports, music, business, theater, and oratory. It represents a method of development that allows the need for change to be addressed in a short time while facilitating greater customization of changing interventions [21].

Coaching activities involve one-on-one dialogue-based work strategies aimed at identifying effective solutions to the beneficiary's problems. Coaching is a way of training the mind that can improve communication skills and behavior control. It starts with personal knowledge and skills, develops competencies, and unlocks individual resources. It must provide professional support for an individual's path to performance, self-management, and continuous personal development.

Coaching includes elements of consulting, training, mentoring, and problem-solving, but it does not fully overlap with any of these approaches. In consulting, an expert provides advice to solve specific problems for a client; in training, an expert instructs and imparts new skills to the trainee; therapy focuses on healing past wounds and resolving personal pain, with the aim of "fixing" what is broken; and in mentoring, an unequal relationship is established where the mentor shares their knowledge, skills, and experience with the mentee. Coaching, in contrast, aims to facilitate growth and unleash an individual's potential to achieve their peak performance [22].

In this respect, there are several ways in which coaching can contribute to the development of the teacher's self-efficacy [23]:

- *Clarification of personal goals and values*—through coaching sessions, teachers can be encouraged to make clear their professional goals and personal values related to learning and education. A deeper understanding of those issues can strengthen motivation and confidence in their own ability to achieve their goals.
- *Reflecting on practice*—coaching provides a safe and stimulating framework in which teachers can reflect on their own learning and teaching experiences. Through guided discussion and questioning, teachers can look in depth at their successes and challenges, and how those influence their perceptions of their competencies.
- *Developing problem-solving skills*—a competent coach can help teachers develop their problem-solving and decision-making skills in the educational context. By exploring and practicing alternative strategies for dealing with difficult classroom situations, teachers can gain confidence in their own ability to deal with various challenges.
- *Constructive and growth-oriented feedback*—through classroom observations and subsequent discussions, teachers can receive guidance and support in identifying their strengths and areas where they can improve their skills.
- *Exploring and applying self-regulation and stress management strategies*—coaching can support teachers in developing effective self-regulation and stress management strategies in demanding educational contexts. By identifying and practicing techniques to reduce stress and maintain work–life balance, teachers can strengthen their sense of control and confidence in their own abilities.

Practically, coaching is a valuable professional development tool for teachers, providing them with the support, guidance, and resources needed to explore and strengthen their self-efficacy for the educational role. Through a personalized and empathetic approach, coaching can contribute significantly to increasing the teacher's professional performance and satisfaction.

3. Coaching Models for Developing Teacher Self-Efficacy for Open Schooling

Coaching models are frameworks for designing the coaching process, helping the coach and the client understand the coaching intervention from a systems perspective. It represents a snapshot of the entire coaching journey taken by a coach and a client during their coaching engagement. However, it should not be prescriptive or a rigid "must-be-this-way" kind of thing. In coaching, the conversation is always about the client.

There are several coaching models and approaches that can contribute to increasing teacher self-efficacy.

Here are some of the most effective:

- *G.R.O.W. model*—this is focused on gaining clarity on what the goal is, the current reality, available options, and the way forward. By exploring those issues, teachers can identify their goals, assess the current situation, generate options, and develop an action plan to improve their performance and self-efficacy [24].
- *OSKAR model*—an approach which is oriented on identifying and amplifying teachers' strengths (appreciative coaching). By exploring positive experiences and past achievements, appreciative coaching helps teachers develop confidence in their abilities and focus their energies on areas where their excellence is evident [25].
- *ACHIEVE model*—an approach targeted at identifying solutions and finding practical ways to overcome obstacles (solution-oriented coaching). Instead of focusing on problems and difficulties, this model helps teachers identify the resources and strategies needed to achieve their goals [26].

Combining such models and approaches in coaching programs for teachers can help increase their self-efficacy and improve performance in the classroom. Hybrid coaching models involve hybrid spaces, where learners may set their goals, act and think on their own initiation anywhere, with synchronized yet non-synchronized time flexibility for maximizing their performance [27]. Moreover, coaching undertaken in a hybrid model, focused on digital skills and competencies for sustainability, can become more effective by integrating a series of key strategies:

- *Blended coaching* approaches—combined face-to-face coaching with virtual sessions to ensure flexibility and accessibility, in which in-person sessions can focus on hands-on activities and relationship-building, and online sessions that can provide ongoing support and resources. Regularly scheduled sessions can provide continuous support, through weekly virtual meetings and monthly in-person workshops.
- *Digital competence* development—developing personalized learning plans based on individual teacher needs and existing digital skills represent useful instruments for projecting coaching sessions to address specific gaps and strengths. Projected workshops on using various digital tools, including Learning Management Systems, educational apps, and virtual collaboration platforms, ensure interactivity and practical support, allowing teachers to practice skills in real time.
- *Competencies for sustainability*—integrating sustainability concepts into different subject areas and providing examples and practical strategies for embedding sustainability into the curriculum represent important actions for teachers who can develop project-based learning units focused on sustainability, with proper guidance on project planning, execution, and assessment.
- *Exploiting digital tools* for coaching—using virtual coaching platforms that allow video conferencing, resource sharing, and collaborative planning, and creating/maintaining digital libraries of resources, including tutorials, lesson plans, and case studies on sustainability education, as a valuable reference for teachers.
- *Professional learning community* (*PLC*) settings—establishing PLCs focused on specific aspects of digital skills and sustainability education can determine such communities meet regularly to discuss challenges, share solutions, and support each other's growth. In addition, online forums and discussion boards can be exploited to facilitate ongoing dialogue and support among teachers.

4. Conceptualization: The CONNECT Coaching Framework in 3 Stages

During the life of the CONNECT project, "*Enhancing Teachers' Self-Efficacy in Open Schooling Settings through Coaching*", a coaching model has been proposed, considering the development of the awareness of the *coach–teacher* relation, but also focusing on taking ownership and responsibility in that relation. In fact, the connection was supposed to be "about doing", while the relationship was "about being", but adding the experience of

being connected with someone. Practically, the CONNECT project proposed a structured program of coaching activities encompassing three distinct phases. Those activities were organized and developed considering the minimum required meetings and aligning with the needs and interests of the beneficiaries and the community. In this respect, the proposed format has been designed in the following stages:

I. Inter/self-knowledge and familiarization stage—represents a critical phase that lays the foundation for a successful coaching relationship, involving a series of key elements:

- Establishing the coach–teacher connection—by building a trusting relationship, essential for open communication and effective coaching, understanding backgrounds, and letting the coach know more about the teacher's personal and professional experience, values, interests, and motivations.
- Clarifying expectations and goals—essential for both the coach and teacher to discuss and agree on the coaching process, roles, and responsibilities, but also for identifying the teacher's goals, aspirations, and desired outcomes from the coaching sessions.
- Assessing the current status—useful for the teacher to reflect on their current situation, strengths, weaknesses, and areas for improvement, and helpful for the coach to provide initial observations and feedback based on preliminary assessment/discussions.
- Exploring values and beliefs—important for teachers to identify the core values and how those values influence their own decisions and behaviors, and relevant for both sides to explore underlying beliefs that may support or hinder the whole progress towards the goals.
- Developing self-awareness—performed through reflection, with the teacher being engaged in self-reflection to gain deeper insights into their thoughts, emotions and behaviors, and continued with tools (proposed by the coach) to enhance the teacher's self-awareness.
- Creating a *coaching plan*—the common work for developing a scheme with specific actions, timelines, and milestones to achieve the teacher's goals, together with measurement and evaluation criteria to evaluate the progress and success throughout the coaching journey.
- Defining proper techniques and/or tools—like in-depth discussions to gather information and understand the teacher's perspective, or various instruments for personality assessments, feedback, or self-assessment questionnaires, completed with reflection exercises to promote self-discovery.
- Concluding the importance of the first stage—essential for building a strong foundation for the coaching relationship, by ensuring that both parties are aligned and committed, by finding a mutual way—important for the teacher to become oriented with themself, which is crucial for personal and professional growth.

The CONNECT Framework aligns with established coaching models such as the GROW model [24,28,29], which emphasizes goal setting, reality checking, options, and ways forward. In CONNECT, the inter/self-knowledge and familiarization stages were essential for creating a meaningful and effective coaching experience. They set the tone for the coaching relationship and ensured that both the coach and teacher were well prepared to work together towards achieving the teacher's objectives.

II. Real coaching stage—represents the phase where the core of the coaching process occurs. During this stage, both the coach and teacher actively work together to implement the coaching plan, achieve goals, and facilitate personal and professional growth [30]. The key components and activities involved in this stage are as follows:

- Implementing the *coaching plan*—essential for the teacher to begin to take the specific actions outlined in the plan, having the coach's ongoing support, guidance and encouragement.
- Establishing regular coaching sessions—in terms of frequency—and a clear agenda setting, focusing on current challenges, progress, and next steps.
- Monitoring progress—important for the coach and teacher to underline the progress against the milestones and goals set in the coaching plan, with adjustments when needed.

- Developing skills and competencies—relevant for the teacher to achieve the goals, and necessary for the coach to provide opportunities for the teacher to practice new skills and offer constructive feedback.
- Overcoming obstacles—useful for the teacher to identify any obstacles or challenges that arise during the process, but also for the coach to increase collaboration and develop strategies to overcome those barriers.
- Enhancing self-awareness and reflection—through ongoing reflection, the teacher is engaged in self-reflection to gain deeper insights and adjust the approach as needed, and by feedback loops, important for the coach to provide regular feedback to the teacher.
- Building confidence and motivation—crucial for the coach and teacher to celebrate achievements and milestones, with a view to helping the teacher to stay motivated and focused on their goals.
- Continuing learning and development—important for providing new learning opportunities and resource sharing (articles, books, training materials).
- Providing techniques and tools—by experimenting with several successful known models, assessments, and exercises (to support development) as well as feedback.
- Concluding the importance of the second stage—essential for the teacher to take note of progress, to develop new habits and/or acquire new skills, and to sustain long-term personal and professional growth.

In CONNECT, the *second coaching stage* was a dynamic and interactive phase where the coach and teacher actively worked together to achieve the teacher's goals. It involved the implementation of the coaching plan, continuous monitoring and adjustment, skill development, and overcoming challenges. This stage was crucial for translating the insights and plans from the initial stages into meaningful and lasting change.

III. Evaluation stage—represents the final phase of the coaching process, where the coach and teacher assess the effectiveness and impact of the coaching engagement. This stage involves several key components and activities:

- Reviewing the progress and outcomes—important for assessing the extent to which the teacher has achieved the goals set at the beginning of the coaching engagement, and for reviewing the milestones and specific action steps taken during the coaching process.
- Reflecting on the coaching experience—the teacher provides feedback on their own experience, including what worked well and what could have been improved, and the coach reflects on their own performance and the coaching relationship.
- Measuring the impact—in terms of quantitative aspects (metrics and data to evaluate tangible outcomes—improvements in performance, productivity, specific skill development) and qualitative outcomes (increased self-awareness, confidence, changes in mindset or behavior).
- Celebrating success—through celebrating the teacher's progress and reinforcing positive changes and accomplishments, but also acknowledging the effort and commitment the teacher has put into the coaching process.
- Identifying learned lessons and planning for the future—by discussing key elements learned throughout the coaching engagement, and designing future strategies for sustaining the progress and changes made during coaching, with a view to identifying areas for continued personal and professional development.
- Closing the coaching relationship—figuring out (if necessary) the next steps: follow-up sessions, additional coaching, or other forms of support.
- Defining proper techniques and/or tools—like surveys or questionnaires to gather structured feedback from the teacher, progress reports to summarize the achievements, progress, and outcomes of the coaching engagement, and review sessions focused on evaluating the coaching process and outcomes.
- Concluding the importance of the third stage—essential for providing a clear assessment of the coaching engagement's effectiveness and the value delivered to the teacher, and offering insights that can improve future coaching practices and engage-

ments for both the coach and the teacher, with both parties feeling a sense of closure and accomplishment.

In CONNECT, the *evaluating coaching stage* was an important phase that focused on reviewing progress, measuring impact, reflecting on the coaching experience, and planning for future growth. *This stage ensured that the teacher and coach could both understand the outcomes of their work together and identify ways to sustain and build on the progress made during the coaching engagement*.

In the context of open schooling of the CONNECT project, where students collaborate with scientists, families, and teachers to solve real-life problems related to the Sustainable Development Goals (SDGs) while developing sustainability and digital skills, the DigComp EU framework has been applied, as follows [28]:

- *Information and Data Literacy*:
    - Context—students working on SDG projects need to gather, evaluate, and manage relevant information and data from various sources.
    - Application—students learn how to search for reliable information, assess its credibility, and organize data effectively. As an example, while working on a project about clean water (SDG 6), students might collect data on water quality from local sources and compare it with global standards.
- *Communication and Collaboration*:
    - Context—effective communication and collaboration are essential in open schooling projects, as students work with diverse stakeholders, including scientists, community members, and peers.
    - Application—students use digital tools to communicate their findings, collaborate on projects, and share information. They might use video conferencing tools for meetings with scientists or create a collaborative online space to share their progress on a climate action project (SDG 13).
- *Digital Content Creation*:
    - Context—creating digital content to present findings and solutions is crucial for disseminating knowledge and raising awareness about the SDGs.
    - Application—students develop digital presentations, videos, reports, and other content to communicate their project outcomes. For example, they might create a digital campaign to promote sustainable cities and communities (SDG 11), including social media posts, infographics, and videos.
- *Safety*:
    - Context—ensuring the safety of digital interactions and data management is vital, especially when students are working online and sharing information.
    - Application—students learn about data privacy, protecting personal information, and maintaining digital security. In an SDG project focused on quality education (SDG 4), they might use secure online platforms to collaborate with international partners, ensuring that their communication and data are protected.
- *Problem Solving*:
    - Context—open schooling projects often involve identifying problems related to the SDGs and developing innovative solutions.
    - Application—students use digital tools to analyze problems, brainstorm solutions, and implement projects. For instance, in a project addressing affordable and clean energy (SDG 7), they might use software to design energy-efficient models or simulate the impact of renewable energy solutions.

The integration of sustainability issues and digital skills into the CONNECT open schooling philosophy has been made through the following:

- *Collaborative Projects*—by engaging in projects that address real-life challenges, students apply digital skills in practical contexts, enhancing their understanding of both technology and sustainability.
- *Interdisciplinary Learning*—the DigComp framework supports interdisciplinary learning, where digital literacy is integrated with scientific, social, and environmental education.
- *Community Engagement*—open schooling emphasizes community involvement, and digital skills enable students to communicate their findings effectively, advocate for change, and involve a wider audience in their projects.

As a major outcome (recorded in the school-implemented modules), students have not only developed essential digital skills but also become active participants in their communities, equipped to tackle sustainability challenges. They learn to leverage technology for positive social and environmental impact, aligning their education with the goals of sustainable development. Practically, in an indirect way, the CONNECT coaching process has also answered to the students' needs and concerns related to their own personal and professional training and development—the growth and optimization of their cognitive, affective, and social potential, the importance of self-awareness in achieving academic success, and ensuring a well-being status and appropriate self-acceptance in a sustainable manner [31,32].

5. Research Questions

The research questions are focused on the following:

- The exploration of a flexible coaching model, drawing insights from various countries.
- The examination of strategies for multiplying coaches in collaboration with expert teachers.
- The evaluation of resource diversification through platforms, like 1-1 and group interaction.

In this respect, the formulated research questions fall naturally on two main aspects of the CONNECT philosophy pillars—*open schooling* and its proposed *CARE-KNOW-DO methodology*:

- RQ1—What are the key features in the coaching model aimed at increasing teachers' self-efficacy in open schooling for sustainability settings?
- RQ2—What kinds of pedagogical changes have schoolteachers implemented towards a scientific education approach involving digital skills, utilizing the CARE-KNOW-DO methodology embedded within the CONNECT project?

6. Methodology

6.1. Participants

The CONNECT project activities have been implemented during three academic years (2020–2023) by seven partners and engaged 1283 schools, involving 636 science professionals, 131 policymakers, 41,633 families, and 51,488 underserved students in the UK, Romania, Greece, Spain, and Brazil.

In this study, data were provided from 45 coaches who supported 790 teachers. This community adopted the CONNECT science actions, using the CARE-KNOW-DO framework (350—UK; 218—Romania; 102—Spain; and 120—Brazil) and provided data about their practices on a voluntary basis. The number of coaches (in the CONNECT implementation phase, 2nd and 3rd academic year) was 45 in total: 5—the UK (MS); 5—Spain (IRSI—Catalunya); 25—Romania (VUT); and 10—Brazil (APC and UNEB). The study was conducted in accordance with the Declaration of Helsinki, and the protocol was approved by the Ethics Committee of the Open University scientific coordinators HREC/3825 on 2 February 2021.

6.2. Digital Platform for Resources and Coaching

The *CONNECT Multilanguage digital platform* (created by Exus LTD—version 2020—Athens—Greece) for resource management was redesigned based on two basic categories: (i) the Educational Scenario Resources (resources page) which were created in

6 different languages (English, Greek, Spanish, Catalan, Portuguese, and Romanian) by the platform's editors (implementation partners and their teams) in a fully customizable format resembling a blog post, and (ii) the Common Resource Repository (documents page) where all users can upload and share different types of files to facilitate their collaboration and knowledge exchange. The platform is available on the CONNECT website.

The platform was fundamental to supporting teachers in various countries and locations during and after the pandemic and enhancing their digital competencies in the context of open schooling. Figure 1 shows the CONNECT—Digital Platform of open schooling best practices underpinned by the CARE-KNOW-DO framework to enhance sustainability and digital competencies. The example presents educators, experts, and the local community who supported students to create digital games about solar energy.



Figure 1. The CONNECT digital platform of best practices for enhancing sustainability and digital competencies.

6.3. Procedures

In implementing CONNECT, each country tailored the CONNECT coaching framework to align with their specific implementation capabilities and the unique contexts of their schools. Table 1 outlines the coaching model adopted in each country, highlighting both common elements and differences in the approaches used to better address teachers' interests and needs in the implementation of open schooling, ensuring that students acquire the knowledge, skills, attitudes, and values necessary to tackle global challenges for a sustainable future.

Table 1. Coaching model description in each country.

Coaching Model	Phase 1: Inter/Self-Knowledge and Familiarization Stage	Phase 2: Real Coaching	Phase 3: Evaluation
The UK	Three online meetings aimed at initiating coaching before commencing science activities with students. - Meeting 1 (M1): Presentation of the project to educational researchers interested in open schooling, with co-organized online workshops introducing CONNECT to schools. - Meeting 2 (M2): Webinar covering key CONNECT concepts, including the CARE-KNOW-DO framework, science actions, science capital, and open and curriculum-integrated approaches. Teachers engaged in discussions, sharing existing practices, challenges, and drivers. - Meeting 3 (M3): Educational researchers guided teachers in completing pre-questionnaires and planning student activities for developing science actions.	Two meetings and online asynchronous support. Each teacher who completed the pre-questionnaire received personalized feedback, with specific videos developed by the UK team aimed at enhancing coaching. Teachers shared practices they felt confident about and discussed components and strategies they lacked confidence in, supported by video clips. Individual lesson plans, including assessment and digital evaluation tools, were described. Teachers formed WhatsApp groups led by educational researchers to discuss issues before and after students completed science actions. Most meetings were in groups but there were 1-1 interactions too. These meetings supported teachers in guiding students through the process, with a second meeting planned to present best practices.	The third coaching stage was executed through a hybrid conference for teachers to showcase their best practices and attend workshops. The conference featured poster sessions for new coaches, workshops conducted by coaches to engage new teachers, and inspiring talks to foster discussion. Some teachers' practices were recorded and with their consent were made available with public access to support new coaches and new teachers interested in open schooling. They completed evaluation questionnaires and best-practice descriptions based on CARE-KNOW-DO.
Spain	One webinar to introduce the CONNECT project and what open schooling is about, along with the Sentinel School network (from which CONNECT has been implemented at the regional level). One-to-one meetings with schools were held as needed to resolve any doubts they may have about their participation.	The format considered focusing on practical training with teachers. One meeting for an in-depth explanation of the CONNECT project and open schooling, and the presentation of the challenges and educational materials available for implementation. One training session: practical activity with teachers to give them firsthand experience of what they would be carrying out later in the classroom with their students to provide them with the necessary tools, including digital participation tools, and confidence, as this pedagogical methodology was new for most of them. Follow-up meetings with schools to monitor the implementation process and facilitate the sharing of experiences with other schools (discussing what they have accomplished so far, the difficulties they have encountered, the solutions they have found, and their perception of the achievement of objectives so far, and providing feedback on the materials). One-to-one meetings available on demand from schools for personalized assistance to adapt educational materials, help with programming, and address any other issues that may arise.	Assessment of implementation of the CONNECT project. Assessment meetings with teachers to evaluate their process and share their experiences. Evaluation questionnaires to collect comprehensive information about the implementation process, including participation indicators such as dedicated hours, activities, involvement of health professionals and families, and levels of acceptability and satisfaction. These questionnaires also measured the acquisition of knowledge, skills, and attitudes by students, including their science capital, as well as the achievement of the project's objectives related to the specific challenges. A new iteration of co-creation based on the feedback received from teachers, leading to the re-publication of educational materials with incorporated changes to enhance their effectiveness.

Table 1. *Cont.*

Coaching Model	Phase 1: Inter/Self-Knowledge and Familiarization Stage	Phase 2: Real Coaching	Phase 3: Evaluation
Romania	Four online meetings (on Zoom and Microsoft Teams) with teachers, school representatives, and researchers—with the aim of introducing the project, its methodology, the coaching process, and the CONNECT coaching model in detail. - Meeting 1 (M1): Presentation of the CONNECT project to teachers, school representatives, and researchers who showed interest in open schooling and had potential for being involved in an addressed open schooling project. - Meeting 2 (M2): Presentation of a generic science action, and of the CONNECT CARE-KNOW-DO framework, with examples and discussion around its possible implementation in schools, including challenges and particularities of its implementation in pandemic times. - Meeting 3 (M3): Presentation of the proposed CONNECT coaching model to teachers, school representatives, and researchers, by emphasizing the *coach–teacher* relation developed in the designed 3 stages: (I) *inter/self-knowledge and familiarization*; (II) *real coaching*; (III) *evaluation*. - Meeting 4 (M4): Support for the *CONNECT friends*—teachers, school representatives, and researchers—who started to work and adapt the CONNECT training materials, and to select the students' target groups. More assistance was offered to the *CONNECT friends* who were interested in fulfilling all the science action steps.	Three meetings (two online on Zoom and Microsoft Teams, but also one face-to-face meeting) with *CONNECT friends*—teachers, school representatives, and researchers—to offer personalized feedback, for enhancing the coaching process. Various strategies were presented and discussed by the involved teachers through sharing experiences and lessons learned. The interaction with students' families and science specialists/researchers was evaluated. Assessment and evaluation tools were analyzed, and generally, particular links with the national curriculum were emphasized. In the second part of the meetings, sessions for 1-1 interaction were organized.	Four meetings (two on Zoom/Microsoft Teams, but also two demonstrative face-to-face meetings in two CONNECT-participating schools) with *CONNECT friends*—teachers, school representatives, and researchers—for sharing their best practices and attending the follow-up workshops. In this format, new CONNECT coaches and new CONNECT teachers had a proper medium to interact with the *CONNECT friends*, and to benefit from their support. The sessions were finalized with the completion of the evaluation questionnaire and with the projection of the next activities.
Brazil	Online meeting with the school director to present the project and indicate the coach. Visiting schools for a detailed presentation of the project, clarifying any doubts they may have regarding participation. Periodic individual and group meetings were held with the teachers who acted as coaches to support their activities with the teachers in the schools, resolve doubts, work on digital skills, and collaborate in the planning and implementation of the methodology.	In-person practical meetings fortnightly for 4 months to resolve possible doubts, adapt the project to the Brazilian curriculum, and monitor the progress of activities and digital competencies. Individual online meetings, if necessary, between the trainer and the teacher, to resolve specific doubts.	Online meetings with educational researchers to align teacher and student assessment procedures. In-person meetings between coaches and school directors to create a schedule for student use of computer labs. Monitoring the collection of evaluation questionnaires. Online feedback meeting with coaches to identify improvements and adaptations needed for the next semester.

Qualitative data on teaching practices from each country were gathered through one-on-one dialogue-based methods (such as meetings or interviews) and self-report questionnaires (as detailed in Table 1). A deductive thematic analysis was conducted separately on data from each instrument. The resulting codes were compared and merged to

form categories, guided by the CARE-KNOW-DO framework. This process was first carried out within each country and then across the countries to derive collective insights. Our findings highlight both challenges and enablers in coaching that enhance teachers' self-efficacy.

7. Findings

Some coaches greatly assimilated the methodology of the CONNECT project and became spokespersons in their schools, helping colleagues in the planning and execution of the project. In addition, to help classmates from the school itself, some of them agreed to help other schools that were also interested in the project by taking examples of their performances and supporting the organization of the project in other schools.

The coaches who studied postgraduate and were part of the university's team of researchers took the ideas of the CONNECT project and its fundamentals to their thesis research and worked on both fronts in the university team and in the orientation of the schools.

The coaches also contributed to the access and use of the teaching materials produced in the CONNECT project and their application in schools. Some of them were project advisors that were experts in best practices and received certification. The participation as a coach and the certifications received led those teachers to obtain a prominent position in the school, being highly praised by the school administrations for the fact that they obtained greater visibility of the institution due to the awards received.

Teacher Self-Efficacy (RQ1)

In terms of increasing teacher self-efficacy, the CONNECT coaching model demonstrated several key features (KFs) in each of the countries involved. These features are discussed below:

1. *UK KF—inclusion and diversity in the classroom*

   Most teachers in the UK implemented four open schooling scenarios: Rewilding—SDG 15: "Life on Land"; Microplastic—SDG 14: "Life below water"; CO_2 Neutral—SDG13: "Climate Action"; Energy savers—SDG 7: "Affordable and Clean Energy".

In the UK, providing support for teaching in an open schooling environment, where students have varying levels of prior knowledge and STEM abilities, presented challenges for teachers. In fact, that was the central challenge that teachers cared about.

> *"Students have varying levels of prior knowledge and (STEM) abilities—this indeed presented challenges" (Year 7–8 secondary school biology teacher's view shared in an online meeting).*

In this respect, the pedagogical knowledge involved *coaching guidelines* that were discussed and embedded in the materials for teachers. Some video clips including references were also produced and shared in the CONNECT Video Library. Teachers also produced argumentative mapping materials for students with difficulties integrating evidence. The webinars supported by the coaching facilitator with teachers were useful for finding and implementing solutions to support low-ability students.

> *"Teachers used knowledge about interdependence and ecosystems. They also used geographic knowledge information about natural habitats for these animals. The skills that students practiced were devising questions, visual communication, data analysis and the enquiry skill of weighing up evidence to support a claim. They also used math skills to prepare graphs and geographic information about habitat." (Teachers' coach about open schooling—notes)*

The coaching process supported by dialogue, materials, concrete examples, and resources such as argumentative maps for evidence-based decision-making was very useful for teachers to increase their skills in helping students develop persuasive argumentation and communication based on science knowledge and socio-scientific thinking skills.

> *"Students shared questions, created persuasive posters and practiced argumentation using data and facts. They were all engaged in the activities, and they enjoyed researching*

information and making decisions. They were keen to discuss the evidence for their chosen animal during the campaign. Students were interested in and confident in using science knowledge." (Biology teacher report of best practices)

Based on the EU DIGICOMP, the digital skills practiced by teachers and students were problem-solving, information and data literacy, communication, and collaboration. The application of these technological tools helped teachers integrate open learning and increased their confidence in using interdisciplinary approaches, but the focus on self-efficacy was central.

2. *Spain KF—curriculum pressure (high workload for teachers)*

In Spain, incorporating new methodologies—as proposed by open schooling—faced the challenge of fitting into the current system. A recurring obstacle highlighted by teachers in Spain, but also in other countries, was the pressure they faced to meet the established curriculum for each academic year and the high workload they had. CONNECT has taken this obstacle into account by proposing educational materials that meet the curricular needs of each country, which allows progress in the subject matter while not creating an overload of work. In many cases, it has been the key to the participation of schools.

"We have a high workload because of the curriculum and the so many extra activities we have during the whole academic year. This new pedagogical approach with a high degree of freedom required a long time for implementation but it covered part of our curriculum needs, and this was very important to us to finally decide about our participation in the project." (Spanish teacher about open schooling—notes)

3. *Romania KF—setting up a Community of Practice for facing open schooling challenges*

Most teachers in Romania implemented four open schooling scenarios: Rewilding—SDG 15: "Life on Land"; Biodegradable Plastics—a solution to "white pollution"—SDG 3: "Good health and well-being"; CO2 Neutral—SDG13: "Climate Action"; Green Energy and Sustainable Development—SDG 11: "Sustainable cities and communities".

In Romania, the CONNECT coaching model, designed for enhancing teachers' self-efficacy in open schooling settings, proved to be oriented on three key features. They were tailored to support teachers in effectively engaging with *open schooling* issues, the *CARE-KNOW-DO framework,* and overcoming challenges they may face in the process of implementing CONNECT training materials, especially those linked with sustainability issues. In Romania, the key features of the CONNECT coaching model may be synthesized as follows: (a) Improving scientific connections between teachers, science stakeholders, and researchers, collaborative learning, and coaching support—through encouraging teachers and science specialists to work together, sharing experiences, exchanging best practices, and learning from each other. At the same time, a real *CONNECT Community of Practice* was set up—a supportive network where teachers can exchange ideas and best practices in open schooling challenges. (b) Developing the teacher's feelings of *needs-based coaching*—through individualized support which met the specific needs and contexts of individual teachers, but also through a personalized coaching plan, aligned with each teacher's goals and professional development needs. In addition, the teachers benefitted from the necessary support to build confidence in their abilities, to participate in a successful implementation of open schooling. (c) Supporting teachers in integrating sustainability into their teaching practices—through encouraging the teacher to be engaged in reflective practices (peer discussions, self-assessment), considering their own progress and challenges in teaching sustainability, promoting the use of innovative teaching strategies in a didactic approach (project-based learning, interdisciplinary approaches), and the use of digital tools which enhance sustainability education.

"Engaging in the CONNECT Community of Practice has been transformative for my teaching practice and professional growth. The CONNECT community provided a supportive and collaborative learning environment where I could share my experiences, challenges, and successes with fellow educators. This sense of community helped me feel

more connected to a network of professionals who are passionate about innovative teaching methods which also answered to sustainable goals. The network of educators within the CONNECT community became a valuable resource for sharing ideas, resources, and best practices. Moreover, the coach and peer collaboration opportunities provided practical solutions to common teaching challenges, especially for those met in open schooling settings" (Biology teacher report of best practices).

4. *Brazil KF—working with real-life problems relevant to students, families, and scientists*

Pedagogical innovations in Bahia and Paraná, Brazil, were seen in the responses of teachers and students who stated that they had overcome challenges to transform their practices. The main one was the creation of teaching materials such as texts, videos, exhibitions, and prototypes with recyclable materials for pedagogical use and to support learning. Preparing maps, photographing and analyzing real natural contexts, making graphs, and seeking answers to scientific questions created by teachers and students were the highlights of the lessons learned.

"The teachers challenged themselves by getting the entire school involved in a way that transformed the questions, the tools created, the visits, the classes, the entire school environment." (Teachers' coach notes)

In the following paragraphs, for each involved CONNECT country, the pedagogical changes (PCs) that schoolteachers had to implement by introducing the CARE-KNOW-DO methodology embedded within the CONNECT project (*RQ2*) are specified.

1. *UK PC—address inclusion and diversity*

In the UK, key changes in teaching practices were using open schooling resources and community-based activities for students to interact in and outside school including students with low abilities and difficulties. Teachers overcame the difficulty of teaching different levels of students at the same time supported by flexible resources provided in the open schooling model. Teachers also worked with interdisciplinary activities as reported by them, resulting in multiliteracies as follows.

"Nicely with all the skills embedded. All the skills covered—literacy, numeracy, team worker etc." (Biology teacher—Rewilding)

2. *Spain PC—teach scientific competencies based on the students' interests*

In Spain, teachers have been trained to implement educational resources that combine the CARE-KNOW-DO methodology with community-based participatory research. With the training and support of coaches, teachers incorporated new tools to conduct classroom research that addressed real challenges faced by students through a participatory approach that engaged the entire educational community. In this way, CONNECT has contributed to expanding teachers' options for developing the scientific, digital, and civic competencies required by both the curriculum and society for their students in a more engaging and meaningful way. Focusing on real problems faced by the students has facilitated the inclusion of work on the Sustainable Development Goals, as most of the topics chosen by the students were directly related to them.

"the process has enabled students to recognize that science can be a pathway to solving their everyday problems, while enhancing their scientific and civic participation skills" (Spanish teacher).

Based on the EU DIGICOMP, the digital skills practiced by teachers and students were problem-solving, information and data literacy, communication and collaboration, and digital content creation.

3. *Romania PC—recording pedagogical changes for meaningful learning*

In Romania, the CARE-KNOW-DO methodology embedded within the CONNECT project supports teachers in transforming their pedagogical practices, based on challenging the students with more scientific and inquiry-based approaches. In this way, teachers have

made significant pedagogical changes that foster curiosity, deepen understanding, and apply knowledge in meaningful ways. Those changes have contributed to a more engaging, relevant, and effective scientific education for students. In this respect, the *CARE-KNOW-DO framework* has had an impact on the following: (a) Updating teachers' knowledge and ensuring their *ongoing professional development*—mostly focusing on developing specific didactic skills—STEAM project-based learning, interdisciplinary teaching, student engagement strategies, students' family involvement (especially on topics which target SDGs), etc., and familiarizing with open schooling principles and practices. (b) Encouraging teachers to be engaged (together with their students) in *action research* to test and refine open schooling approaches in their own classrooms. At the same time, the teachers may easily assess the impact of their teaching strategies on student learning and engagement, and together with the educational decision-makers (school managers, school inspectors, and representatives from the Ministry of Education), cultivate a school culture that values and supports innovative teaching practices. (c) Establishing a valuable professional learning community (based on the teacher cohort trained in the CONNECT project), where members can collaborate, share experiences, and learn from each other's successes and challenges in implementing sustainable practices.

> *"Through the CARE-KNOW-DO framework, we learned how to make science education more engaging and relevant for our students. We worked on real-world projects that targeted various SDGs ("Life on Land", "Good health and well-being", "Climate Action", "Sustainable cities and communities") that not only deepened their understanding of scientific concepts but also developed their critical thinking and problem-solving skills. Noticing our students' enthusiasm and engagement was incredibly rewarding." (Romanian school representative)*

4. *Brazil PC—working with real-life problems relevant to students, families, and scientists*

In Bahia and Paraná in Brazil, UNEB and PUCPR, respectively, led the process of planning and implementing open schooling with the CARE-KNOW-DO methodology with a coaching team made up of teachers from elementary schools who participated in the CONNECT project. In evaluating the process, answering questionnaires and participating in interviews, teachers and students declared that their experiences were truly innovative. They realized that they were acting scientifically and learning to produce knowledge about real problems in their communities with evidence-based argumentation in strong connection to the SDGs, which was key for open schooling interaction with family and scientists.

> *"The students loved the practical classes and realized the importance of science in their daily lives. Connecting the school's scientific content with the student's reality made the community and families participate more in the school." (Public school director in southern Brazil)*

In summary, the CARE-KNOW-DO methodology enhances the coaching process by encouraging members to value all aspects of sustainability issues, including community and global impact, resilience and adaptation, increased awareness and knowledge, and behavioral changes. This approach promotes sustainable practices for students, families, and scientists. Each action, pedagogical material, and class activity focuses on real-life issues, fostering a sense of responsibility and collective action towards environmental stewardship. By employing interdisciplinary approaches and innovative solutions, this methodology cultivates lifelong sustainable habits and lifestyles. Additionally, it promotes intergenerational learning by involving families and students in discussions about consumption, environmental footprints, and the global impact of their behaviors and choices.

The results indicate that the implementation of the CONNECT project had a significant impact on the self-efficacy of the participating teachers, with clear improvements in their confidence and competence in applying open and sustainable teaching methodologies. In the United Kingdom, the coaching model adopted was characterized by continuous and personalized support, which helped teachers build confidence in applying pedagogical

practices geared towards sustainability. This coaching model included individualized follow-up, collaborative planning, and the use of constant feedback, allowing teachers to effectively adapt to the demands of heterogeneous classes and focus on integrating digital skills into their pedagogical practices. In Spain, personalized coaching support helped teachers overcome curriculum pressures and incorporate new pedagogical approaches, including interdisciplinary and sustainable methods, without overburdening their responsibilities. This model was particularly effective in enhancing teachers' self-efficacy in working with sustainability-focused curricula, supporting the use of digital and collaborative pedagogical tools.

In Brazil, the implementation of the CARE-KNOW-DO methodology within the CONNECT project led to pedagogical changes aimed at connecting scientific content to the students' local realities, incorporating digital skills in a meaningful way. Teachers were trained to use technological resources such as support videos, argument maps, and digital platforms, which facilitated a more collaborative and interactive approach to scientific education. They also began to lead educational activities that involved both the community and the school environment, promoting a more contextualized and sustainable teaching approach. These pedagogical changes resulted in increased teacher confidence in conducting classes that integrate science and technology in a practical and applicable way to the students' daily lives, particularly regarding solving local problems and fostering social engagement in sustainability issues.

8. Discussion

The discussion of the results highlights the main contribution and impact of the coaching process in the implementation of the CONNECT philosophy, targeting the following aspects:

- *Dissemination of the science actions of CONNECT*—one of the significant findings of this study is the *deep assimilation* of the CONNECT project methodology by the coaches. They not only applied the concepts in their schools but also became influential leaders, empowering colleagues in the planning and execution of projects. This suggests a strong acceptance and adoption of the CONNECT principles in the school environment. Our findings contribute to existing studies [28] showing that coaching can effectively improve teacher leadership.
- *Collaboration between schools*—besides impacting their own schools, the coaches also demonstrated a proactive willingness to share knowledge and experiences with other schools interested in CONNECT. Our results also expand previous research [29] that presents coaching based on partnerships and working together with equals in promoting collaboration. This aligns with a collaborative spirit that extended the reach and influence of the project, promoting its adoption on a broader scale.
- *Integration of the EU DigiComp Framework in the coaching process*—the *EU DigiComp Framework* has played a key coaching role in training teachers to integrate open science principles into their pedagogical practices, aligning with the SDGs. This training focused on the five key competencies outlined in the DigiComp framework [30]: *information and data literacy*, *communication and collaboration*, *digital content creation*, *safety*, and *problem-solving*. Through this comprehensive training, the EU DigiComp Framework not only enriched teaching methodologies but also promoted sustainable and innovative education, directly supporting the SDGs.
- *Integration with academic research*—the participation of postgraduate coaches who integrated into the university research team reveals a valuable connection between practice and research. Those professionals were able to articulate the SDGs and the fundamentals of CONNECT in their thesis research, thereby enriching both scientific and practical knowledge in the educational field.
- *Access use and co-creation of didactic materials*—the alignment of the coaches' contribution to sharing and facilitating access and use of the platform. The reciprocity of the didactic materials produced in CONNECT is another relevant point that aligns with

research [29] stating that coaches learn alongside teachers and vice versa. This suggests not only effective implementation but also a resource-sharing approach that directly benefits digital competencies and pedagogical practices in schools. *Examples* have been developed by teachers supported by coaches to enhance digital learning for sustainability competencies integrating CARE-KNOW-DO principles, also including emerging technologies [33].

- *Recognition and certification*—obtaining certifications and collaborative actions reflect the recognition and appreciation of the coaches' work. This recognition not only strengthens the position of these professionals within schools but also highlights the relevance and effectiveness of CONNECT in terms of best educational practices.
- *Impact on the visibility and reputation of the school*—the recognitions and awards received by the coaches not only highlight them individually but also bring greater visibility and prestige to the schools involved. This can have a positive effect on their reputation and their ability to attract resources and external recognition, corroborating previous studies [21].
- *Valuing the basic role of coaches*—the implementation of the CONNECT project produced significant contributions and impacts, as evidenced by the results discussed. An important conclusion of this study is the fundamental role played by the coaches in disseminating the CONNECT methodology and promoting actions in schools. These findings contribute to studies [28] that state that coaches make a significant difference when their objective is well conceived in the project. The coaches not only adopted the project principles but also emerged as influential leaders, guiding colleagues in project planning and execution. This highlights a robust acceptance and internalization of the CONNECT principles in the educational setting. In conclusion, the central role of coaches in the CONNECT project signifies not only successful implementation but also a transformative influence on educational practices and institutional standing.

Based on the findings of this study, we recommend that educational policymakers prioritize the integration of sustainability and digital competencies into teacher training programs through structured coaching models like the CONNECT framework. Specifically, policies should encourage ongoing professional development that aligns with the DigComp EU framework to enhance both digital literacy and self-efficacy in teaching sustainability. In practice, schools should foster open schooling environments that encourage collaboration between teachers, students, and the community, supported by resources and curriculum updates that address real-world sustainability challenges. These steps would not only improve teaching efficacy but also prepare students for active participation in solving global sustainability issues.

9. Conclusions

The implementation of the CONNECT project coaching model, with its flexibility and focus on teachers' difficulties and needs, has made substantial contributions to enhancing teacher self-efficacy, underpinned by the CARE-KNOW-DO framework for enhancing sustainable education. Our findings indicate that a combination of approaches—such as one-on-one interactions, group discussions, and large community engagements to support them with their national curriculum targets as well as Sustainable Development Goals—significantly improves teacher performance and self-efficacy within the context of open schooling. *This process not only enhances teaching and learning competencies but also fosters collaborative personal development in the context of sustainability*. The deep assimilation of the CONNECT methodology by the coaches, who emerged as influential leaders within their schools, underscores the project's effectiveness in promoting best educational practices and teacher leadership.

The collaborative nature of the CONNECT project has been a key factor in its success in enhancing students' STEM skills and digital and sustainability competencies. Coaches showed a proactive willingness to share knowledge and experiences with other schools, thus expanding the project's reach and influence. The CONNECT project has attracted

thousands of teachers interested in empowering students to develop their science connection [17], science capital [34–36], and transversal skills [36,37]. This collaboration aligns with the principles of partnership and equality, as described in previous research, facilitating the broader adoption of CONNECT's innovative pedagogical approaches. Additionally, the integration of postgraduate coaches into the university research team underscores the valuable connection between academic research and practical application, enriching both scientific and practical knowledge in the educational field.

Recognition and certification of the coaches' efforts have further validated the impact of the CONNECT project in the context of open schooling for sustainability. The awards and acknowledgments received not only enhance the coaches' professional standing but also bring greater visibility and prestige to the schools involved. This positive recognition can attract additional resources and external validation, reinforcing the effectiveness of the CONNECT methodology. In summary, the central role of coaches in the CONNECT project signifies a transformative influence on educational practices, fostering a culture of continuous improvement and collaborative learning that benefits both teachers and students.

The research faced significant challenges due to the COVID-19 pandemic, as teachers struggled with the unique difficulties posed by the pandemic. Additionally, the difference between the school calendar in Brazil and Europe required adaptations to the activities conducted.

For future research in sustainability education, it is essential to explore how the CONNECT coaching model can be adapted and expanded to different educational contexts, particularly in diverse socio-economic and cultural environments. This could provide valuable insights into its broader applicability and the potential for scalability in promoting teacher self-efficacy and sustainability competencies.

In conclusion, by addressing these challenges and expanding its scope, the CONNECT project holds the potential to become a reference in advancing sustainable education practices worldwide, driving both teacher and student development toward a more sustainable future.

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